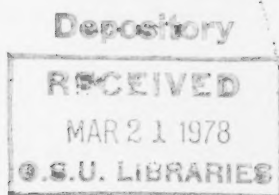


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SELECTED **WATER RESOURCES ABSTRACTS**



VOLUME 11, NUMBER 5
MARCH 1, 1978

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No5 W78-01701 -- W78-02200
CODEN: SWRABW

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology,
U.S. Department of the Interior



VOLUME 11, NUMBER 5
MARCH 1, 1978

W78-01701 -- W78-02200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department.

ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selecting Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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- 02 **WATER CYCLE**
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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70, Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E.
W78-01866

2B. Precipitation

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE, North Dakota Univ., Grand Forks, Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-01909

THE VARIATION OF METEOROLOGICAL ELEMENTS WITH INCREASING ALTITUDE IN THE EASTERN BORDER MOUNTAINS OF RHODESIA, Meteorological Service, Salisbury (Rhodesia). J. D. Torrance.
Rhod J Agric Res. 11(2), p 181-189, 1973.

Descriptors: *Meteorology, *Climates, Climatological data, *Airstreams, *Altitude, Evaporation, Humidity, Mountains, Radiation, Rainfall, Rhodesia, Temperature.

Five meteorological sites on the John Meikle Forest Research Station on the Eastern Border of Rhodesia, with altitudes ranging from 700 m-1800 m within a distance of 11 km, can be considered to be exposed to the same airstreams. The climatological records, how covering over 3 yr, were analyzed to show the effects of altitude and how these effects vary during the course of the year. The elements analyzed include temperature, relative humidity, rainfall, evaporation and radiation.-Copyright 1974, Biological Abstracts, Inc.
W78-01918

INVESTIGATIONS OF THE METEOROLOGICAL INFLUENCES ON THE DRY MATTER INCREASE OF SPRING BARLEY AND WINTER WHEAT IN THE PANNONIAN CLIMATE AREA: II. RESULTS OF INVESTIGATIONS IN THE YEARS 1971 AND 1972, (IN GERMAN), Hochschule fuer Bodenkultur, Vienna (Austria). Inst. fuer Pflanzenbau und Pflanzenzuechtung.
For primary bibliographic entry see Field 3F.
W78-01968

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: II. ASSESSMENT OF THE MAIN COMPONENTS OF THE WATER BUDGET, Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 3F.
W78-01971

THE FLORIDA AREA CUMULUS EXPERIMENT: RATIONALE, DESIGN, PROCEDURES, RESULTS, AND FUTURE COURSE, National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 3B.
W78-01975

SAMPLING ERRORS IN THE MEASUREMENT OF RAIN AND HAIL PARAMETERS, National Center for Atmospheric Research, Boulder, CO.

H. S. Gertzman, and D. Atlas.
Journal of Geophysical Research, Vol 82, No 31, p 4955-4966, October 20, 1977. 9 fig, 1 tab, 19 ref, 1 append.

Descriptors: *Rain, *Hail, *Statistics, Measurement, Sampling, Particle size, Radar, Rainfall, Analytical techniques, Meteorological data, Meteorology.
Identifiers: *Sampling errors.

All methods of measuring the integrated properties of cloud, rain, or hail populations, such as the water content, precipitation rate, kinetic energy, or distributed fluctuations of the number of particles sampled in each particle size interval and the weighted sum of the associated variances in proportion to their contribution to the integral parameter to be measured. This work generalized and extended that of Joss and Waldvogel by providing a general derivation of the fractional standard deviation (FSD) of any integrated property X such that $X(D) = c(D \text{ to the } n \text{ power})$ for any particle size distribution where D is the particle diameter. In addition, for the case of exponential size spectra, general expressions were derived for the FSD of all integral parameters for sampling devices of constant volume or for (area x time) devices in which sampling volume is a function of particle fall speed. Also presented was a set of universal curves applicable to such parameters from $n = 0$, which corresponds to the measurement of total number concentration, to $n = 6$, which corresponds to the radar reflectivity factor. Equations and curves also were provided to permit corrections for finite upper limits to the size spectrum and, in the case of rain, for a realistic fall speed law. Examples were included to illustrate the magnitude of the expected FSD for a variety of rain and hailfall parameters with sampling instruments now in use. A comparison was made with observed rainfall data to illustrate the methods presented in this paper and some of the difficulties in distinguishing fluctuations of physical and statistical origin. (Sims-ISWS)
W78-01992

LASER ABSORPTION TECHNIQUES FOR THE MEASUREMENT OF ATMOSPHERIC WATER VAPOR CONCENTRATION, University of Western Ontario, London. Dept. of Physics.
E. Brannen, and Z. Kucorovsky.
Journal of Applied Meteorology, Vol. 16, No. 10, p 1072-1076, October 1977. 2 fig, 1 tab, 14 ref.

Descriptors: *Water vapor, *Atmosphere, *Instrumentation, *Analytical techniques, *Measurement, Gases, Precipitable water, Condensation, Meteorology, Vapor pressure, Water types, Spectroscopy.
Identifiers: *Laser absorption techniques, *Water vapor laser, *Lasers, *Laser absorption spectroscopy, Atmospheric constituents, Raman spectroscopy.

A sensitive laser method with fast response time was developed which is suitable for measuring atmospheric water vapor concentration. The method utilizes the absorption of 33.02 and 27.972 micrometer radiation from a water vapor laser. Experiments were carried out in a 2 m controlled atmosphere absorption cell at conditions corresponding to ground-level to high-altitude atmospheric pressures. Typically, an absorption of 1% was produced in a 1 m path length by a water vapor pressure of 1.1 Pa at ground level and 2.2 Pa at 5 km using 33.02 micrometer laser radiation. With 27.972 micrometer laser radiation, the absorption is about a factor 50 less and can be used when higher concentrations of water vapor are encountered. The response time of the detecting apparatus can be less than a second and still achieve these sensitivities. Possibilities of building an airborne instrument for measuring water vapor concentration were discussed. (Henley-ISWS)
W78-01997

TREE-RING-DROUGHT RELATIONSHIPS IN THE HUDSON VALLEY, NEW YORK, Lamont-Doherty Geological Observatory, Palisades, NY.
E. R. Cook, and G. C. Jacoby, Jr.
Science, Vol. 198, No. 4315, p 399-401, October 28, 1977. 3 fig, 15 ref. NSF ATM75-21226.

Descriptors: *Dendrochronology, *Precipitation (Atmospheric), *Air temperature, *New York, Climatology, Rainfall, Temperature, Evaporation, Evapotranspiration, Correlation analysis, Trees, Oak trees, Pine trees, Hemlock trees, Weather, Vegetation, Meteorology.
Identifiers: *Hudson River Valley (NY).

Annual tree-ring chronologies from certain well-drained sites in the Hudson Valley of New York record past changes in temperature and precipitation. This information accounts for much of the July variation in Palmer drought severity indices during the period 1931 to 1970 and is used to develop a preliminary reconstruction of drought as long ago as 1728. (Sims-ISWS)
W78-01999

THE CLIMATE AND VEGETATION ON TENERIFE WITH SPECIAL REGARD TO FOG PRECIPITATION, (IN GERMAN), Goettingen Univ. (West Germany). Systematisch-Geobotanisches Inst.
F. Kaemmer.
Scr Geobot. 7, p 1-78, 1974.

Descriptors: *Fog precipitation, Anagryislatifolia, Ardisia-bahamensis, *Canary Islands, Climate, Cloud, Cover, Cytisus-tener, Dracaena-draco, Fog, Ilex-perado, Juniperus-cedrus, Laurel, Lichen, Moss, Ocotea-fetens, Pinus-canariensis, Pulmonaria, Radiation, Rhamnus-integrifolia, Sideroxylon-marmulano, Spain, Tenerife, Usnea, Vegetation, Visnea-mocanera, Wind.

On Tenerife (Canary Island) measurements of precipitation (according to Hellmann) and of fog precipitation (according to Grunow) were carried out at 25 stations from summer 1970-spring 1972. Measurements of precipitation were also made with numerous small rain gauges inside and outside of forest stands. Flora, vegetation and site conditions were likewise studied. Frequent and intense fog precipitation occurs on Tenerife, especially along mountain crests lying perpendicular to the direction of the prevailing cloud-carrying winds. During winter, fog precipitation is possible in nearly all altitudes. In summer it is mainly restricted to between 700-800 and 100-1200 m, due to the sinking of the upper limit of the clouds. The seasonal distribution of fog precipitation is similar to that of the normal precipitation. The seasonal sequence of periods of normal precipitation and dryness are decisive factors for the distribution of vegetation types on the Canary Islands. The cloudiness, the saturation deficit of the air and the radiation, which increases above approximately 1000 m altitude, are important for the altitudinal zonation of the vegetation on the Canary Island, especially for the upper limits of laurel forests and of Pinus canariensis forests. Fog precipitation influences laurel forests less than previously supposed. In the mixed P. canariensis-laurel forests and in the pure P. canariensis forests in higher altitudes the additional precipitation can amount locally to at least 2500 mm/yr. These forest types are affected by the summer drought, because they are situated normally above the cloud cover. The distribution of laurel forests or of other forest types is not clearly influenced by the intensity and the seasonal distribution of fog precipitation. Fog precipitation and its climatic conditions favor epiphytic mosses and lichens of the Pulmonaria type. Lichens of the Usnea type are restricted to foggy forests, where the fog is moved slowly or not at all by the wind. The intensity of fog precipitation caused by a given plant species is

Field 2—WATER CYCLE

Group 2B—Precipitation

primarily dependent on its height and exposure to wind and clouds. The structure and size of its foliage is less important. A brief description of forest types and of their altitudinal zonation and distribution maps of 10 woody species (*Visnea mocanera*, *Ardisia bahamensis*, *Ocotea foetens*, *Sideroxylon marmulano*, *Dracaena draco*, *Anagyris latifolia*, *Juniperus cedrus*, *Rhamnus integrifolia*, *Ilex perado*, *Cytisus tener*) on Tenerife are given. —Copyright 1975, Biological Abstracts, Inc. W78-02015

TOTAL WATER CONTENT INSTRUMENT, Office of the Secretary (Air Force), Washington, DC. (Assignee). For primary bibliographic entry see Field 7B. W78-02140

2C. Snow, Ice, and Frost

GREAT LAKES ICE THICKNESS PREDICTION, National Oceanic Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab. R. A. Assel. Journal of Great Lakes Research, Vol. 2, No. 2, p 248-255, December 1976. 2 fig, 2 tab, 11 ref.

Descriptors: *Lake ice, *Great Lakes, *Air temperature, *Regression analysis, Temperature, Ice, Ice cover, Correlation analysis, Forecasting, Weather, Lakes, Freezing. Identifiers: *Ice thickness, Freezing degree days, Thawing degree days.

Weekly ice thickness data, collected from 24 bay, harbor, and river sites on the Great Lakes, were correlated with freezing degree-day accumulations to develop regression equations between ice thickness and freezing degree-days. The data base at ice measurement sites was 3 to 8 winters in length. The standard error of estimate varied for individual regression equations and averaged between 7 and 8 cm for five forms of regression equations. Because the regression equations are empirical, the range of input data used to predict ice thickness should be limited to the range of values used in the derivation. (Sims-ISWS) W78-01983

A VISCOUS SEA ICE LAW AS A STOCHASTIC AVERAGE OF PLASTICITY, National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab. W. D. Hibler. Journal of Geophysical Research, Vol. 82, No. 27, p 3932-3938, September 20, 1977. 7 fig, 1 tab, 17 ref. NOAA 04-3-022-33.

Descriptors: *Sea ice, *Plasticity, *Model studies, Mathematical models, Stochastic processes, Viscosity, Ice, Stress, Strain, Mechanical properties, Equations, Simulation analysis, Oceans, Oceanography. Identifiers: *Sea ice deformation.

Over the last several years the applicability of viscous constitutive laws to sea ice on the geophysical scale has been questioned because the local characteristics of sea ice deformation appear to be plastic in nature. In order to provide a more fundamental physical basis for a viscous law, this paper demonstrated that if time and/or length scales are chosen large enough, then stochastic variations in sea ice deformation rates can cause the average stress-strain rate relationship on these scales to take on viscous characteristics, even though the nonaveraged relationship is plastic in character. In particular, when a two-dimensional plastic model with an elliptical yield curves is used, the stochastically averaged stress-strain rate

relationship takes the form of a viscous law with a pressure term. Examination of actual sea ice deformation time series and deformation rates simulated by red noise suggests that minimal time scales for the application of such averaging arguments can be as short as 1 day. The calculations also yield an empirical ratio between the plastic strength of the ice and the viscous parameters. It was concluded that the viscous law, with the inclusion of a bulk viscosity and pressure term, is applicable to sea ice modelings. (Sims-ISWS) W78-01990

A STUDY OF THE STABILITY OF A MODEL CONTINENTAL ICE SHEET SUBJECT TO PERIODIC VARIATIONS IN HEAT INPUT, Northwestern Univ., Evanston, IL. Dept. of Geological Sciences; and Northwestern Univ., Evanston, IL. Engineering Sciences and Applied Mathematics. G. E. Birchfield. Journal of Geophysical Research, Vol. 82, No. 31, p 4909-4913, October 20, 1977. 5 fig, 8 ref.

Descriptors: *Glaciers, *Ice, *Model studies, Mathematical models, Snow, Ice, Glaciation, Ice loads, Ice cover, Solar radiation, Climatology, Paleoclimatology, Glaciology. Identifiers: *Continental ice sheets.

A study was presented of the general response of an ice age ice sheet model recently developed by Weertman. The model was subjected to fluctuating insolation on time scales of the order of the variations in the earth's orbital parameters, which happen also to be the characteristic internal time scales of the model displays a wide range of behavior for reasonable parameter values, ranging from periodic growth and decay of ice sheets alternating with interglacial intervals to growth of large permanent ice sheets alternating with interglacial intervals to growth of large permanent ice sheets of periodically fluctuating size. The model displays nonlinear behavior analogous to a rectifier; as a consequence, a possible explanation of the 100,000-year cycle observed in geological climate time series was suggested. (Sims-ISWS) W78-01991

METHOD OF MOVING A FLOATING BODY INTO A PREDETERMINED FLOAT PATH, Atlantic Richfield Co., Los Angeles, CA. (Assignee). L. E. Wilson.

U.S. Patent No. 4,030,305, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 959, No. 3, p 997, June 21, 1977.

Descriptors: *Patents, Density, Density currents, Floating, Ice bergs, Sea water, Navigation, Float path.

This invention is described in terms of an iceberg floating in an ocean or sea of salt water. However this invention broadly applies to any body floating in a liquid wherein it is desired to redirect the floating body from its natural drift path to a different predetermined float path. The invention is particularly desirable for the redirection of exceedingly large, ponderous floating bodies which are not easily moved by physical means. A method is provided for moving a body in a predetermined float path which is different from the body's natural drift path without the use of brute force to redirect the body. This is accomplished by reducing the density of the liquid in which the body is floating, the reduction in density being achieved generally in the direction of the predetermined float path. The area of liquid which is reduced in density thereby provides a path of lesser resistance for travel than the surrounding liquid which is of normal density so that the body will tend to tumble toward and/or sink deeper toward the less dense liquid. Any floating body in any liquid can be led in the manner contemplated by the concept of this invention utilizing any desired liquid density reduc-

tion means. More specifically a ship having an air compressor which is connected to a hose carrying a submerged nozzle with aeration jets can bubble air into the area and thereby reduce the density of the sea water in the area relative to the rest of the water. (Sinha-OEIS) W78-02126

2D. Evaporation and Transpiration

A SIMPLE MODEL FOR ESTIMATING THE EVAPORATION FROM A SHALLOW WATER RESERVOIR, Freie Univ. Berlin (West Germany). Inst. fuer Meteorologie. K. Fraedrich, A. Behlau, G. Kerath, and G. Weber. Tellus, Vol. 29, No. 5, p 428-434, October 1977. 2 fig, 7 ref.

Descriptors: *Model studies, *Evaporation, *California, Reservoirs, Latent heat, Energy, Energy-gradient, Mass, Heating, Hydrologic properties, Temperature. Identifiers: *Salton Sea, *Shallow water reservoir, Energy fluxes, Mass budget, Heating process, Hydrological forcing, Time scales, Latent heat fluxes.

A simple model of the energy fluxes of a well-mixed water reservoir was presented based upon its energy and mass budget. The heating processes due to atmospheric-radiative and hydrological forcing were separated and parameterized in terms of 2 characteristic temperatures. Accordingly, 2 related time scales were deduced which describe the energetical response of the reservoir on the 2 forcing mechanisms. Three different approximations for the latent heat fluxes were introduced. The model, which included the complete energy balance, was applied to the Salton Sea, California, and showed good agreement with the observations. (Roberts-ISWS) W78-01998

2E. Streamflow and Runoff

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY, Kentucky Water Resources Research Inst., Lexington. For primary bibliographic entry see Field 5A. W78-01822

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW, Kentucky Water Resources Research Inst., Lexington. For primary bibliographic entry see Field 4D. W78-01823

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975, Geological Survey, Houston, TX. Water Resources Div. For primary bibliographic entry see Field 7C. W78-01873

MAGNITUDE AND FREQUENCY OF FLOODS IN CALIFORNIA, Geological Survey, Menlo Park, CA. Water Resources Div. A. O. Waananen, and J. R. Crippen. Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 510. Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-21, June 1977. 96 p, 15 fig, 6 tab, 32 ref.

WATER CYCLE—Field 2

Groundwater—Group 2F

Descriptors: *Flood frequency, *Peak discharge, *Streams, *California, *Flood data, Small watersheds, Streamflow, Flow rates, Regression analysis, Equations, Rainfall-runoff relationships, Regional analysis, Urban runoff, Environmental effects, Evaluation.

The magnitude and frequency of floods from gaged and ungaged drainage areas in California, for any recurrence interval from 2 to 100 years, can be estimated by use of the method presented. Equations relating flood magnitudes of selected frequency to basin characteristics such as drainage area, precipitation, and altitude were developed for six regions in the State. Nomographs are included for solution of the equations. Annual peak discharges for more than 700 streamflow stations, including more than 340 stations on streams with basins smaller than 10 square miles, were included in the analysis. Maximum known peak discharges are shown and their relation to drainage areas defined. Data on basin characteristics used in the regression analyses are tabulated. Some adjustments for urbanization effects based on flood-peak ratios for developed and undeveloped areas are suggested. (Woodard-USGS)

W78-01874

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA

Geological Survey, St. Paul, MN. Water Resources Div. L. C. Guetzkow.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 509. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-31, May 1977. 33 p, 6 fig, 4 tab, 11 ref.

Descriptors: *Flood frequency, *Frequency analysis, *Flood forecasting, *Regression analysis, *Minnesota, Streamflow, Rainfall-runoff relationship, Flow characteristics, Peak discharge, Statistical methods, Regional analysis, Estimating equations, Hydrologic data, Natural flow, Flood recurrence interval, Ungaged watersheds.

Estimating relations have been developed to provide engineers and designers with improved techniques for defining flow-frequency characteristics to satisfy hydraulic planning and design requirements. The magnitude and frequency of floods up to the 100-year recurrence interval can be determined for most streams in Minnesota by methods presented in this report. By multiple regression analysis, equations have been developed for estimating flood-frequency relations at ungaged sites on all natural flow streams which are not significantly affected by man-made regulation, diversion, or urbanization. Eight distinct hydrologic regions are delineated within the State with boundaries defined generally by river basin divides. Regression equations are provided for each region which relate selected frequency floods to significant basin parameters; such as, drainage area, slope, and storage. For main-stem streams, which traverse regional divides and which may be affected by regulation, graphs are presented showing floods for selected recurrence intervals plotted against contributing drainage area. Flow-frequency estimates for intervening sites along the Minnesota River, Mississippi River, and the Red River of the North can be derived from these graphs. Flood-frequency characteristics are tabulated for 201 gaging stations having 10 or more years of record. (Woodard-USGS)

W78-01875

FLOOD EFFECTS ON STREAM ECOSYSTEMS

Soil Conservation Service, Little Rock, AR. R. A. Grizzell.

Journal of Soil and Water Conservation, p 283-285, November-December, 1976. 1 tab, 23 ref.

Descriptors: *Floods, *Flood damage, *Ecosystems, *Streams, *Sedimentation, Runoff, Erosion, Ecology, Aquatic habitats, Spawning.

Floods affect entire ecosystems by increasing stream sediment loads, covering croplands with sand and gravel, damaging vegetation, disrupting riffles, killing animals and destroying habitats. Sedimentation, one of the most serious results, is the major water pollutant in the United States. Suspended solids in streams are estimated to be 700 times the sewage loadings. Sediment carries pollutants and reduces photosynthesis, oxygen content in water, and the survival rate of invertebrate and fish eggs. It seriously interferes with the food-finding activities of many valuable predator fish, and damages spawning grounds. Floods flush streams enough to temporarily reduce concentrations of sulphates and chlorides. The scouring action of floods often devastates plant life in or near streams (including overhanging trees and shrubs); epilithic plants and phytoplankton may be dramatically reduced. Seasonal floods can affect fish spawning; for example, eggs of fall-spawning brook trout were decimated by winter floods, and the survival rate of spring-spawned rainbow fry increased due to reduced competition from young brook trout. Such changes in species composition may endure for years. (Lynch-Wisconsin)

W78-01919

2F. Groundwater

SETTLEMENT OF VENICE AND GENERAL ESTUARINE DEPOSITS

Cape Town Univ. (South Africa). For primary bibliographic entry see Field 2L. W78-01829

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA

Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center. For primary bibliographic entry see Field 5B. W78-01848

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA

Geological Survey, Menlo Park, CA. Water Resources Div. For primary bibliographic entry see Field 4B. W78-01863

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO

Geological Survey, Albuquerque, NM. Water Resources Div. For primary bibliographic entry see Field 7C. W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO

Geological Survey, Albuquerque, NM. Water Resources Div. For primary bibliographic entry see Field 7C. W78-01868

GEOELECTRIC SOUNDING FOR ESTIMATING AQUIFER HYDRAULIC CONDUCTIVITY

Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering. W. E. Kelly.

Ground Water, Vol 15, No 6, p 420-425, November-December 1977. 5 fig, 3 tab, 17 ref. NSF GK-42130.

Descriptors: *Hydraulic conductivity, *Resistivity, *Electrical resistance, *Rhode Island, On-site investigations, Aquifers, Pump testing, Hydrologic properties, Permeability, Conductivity, Measurement, Equipment, Data processing, Regression analysis, Groundwater, Hydrology.

The objective of this study was to develop surface electrical resistivity methods for estimating hydraulic conductivities in glacial outwash materials. Aquifer electrical resistivities were determined from the results of Schlumberger electrical soundings at six sites in southern Rhode Island where pumping tests has previously been made. Hydraulic conductivities and transmissivities determined from pumping tests then were correlated with resistivities obtained from electrical soundings. Results indicated that electrical resistivities determined from soundings can be used to predict aquifer hydraulic conductivities; an empirical was developed. A semiempirical relation between aquifer formation factor and hydraulic conductivity also was developed. (Sims-ISWS)

W78-01994

CLEAT ORIENTATION AND AREAL HYDRAULIC ANISOTROPY OF A WYOMING COAL AQUIFER

California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 4B. W78-01995

THE SIGNIFICANCE AND PREDICTION OF OBSERVATION WELL RESPONSE DELAY IN SEMICONFINED AQUIFER-TEST ANALYSIS

Institute of Geological Sciences, London (England). Dept. of Hydrogeology. J. H. Black, and K. L. Kipp, Jr. Ground Water, Vol. 15, No. 6, p 446-451, November-December 1977. 4 fig, 1 tab, 10 ref.

Descriptors: *Observation wells, *Water levels, *Aquifer testing, *Graphical analysis, *Curves, Aquifers, Pumping, Equations, Leakage, Aquitards, Aquicludes, Drawdown, Transmissivity, Storage coefficient, Hydraulic conductivity. Identifiers: *Leaky aquifers, *Slug test, *Type curves, Response, Delay.

The concept of the observation well as a measuring instrument with its own response characteristics was developed, and a method for response evaluation was derived based on methods of slug-test analysis. The effect of well response time upon the results of semiconfined aquifer tests was calculated, and a series of type curves was produced. The ambiguity of observation well response affected leaky aquifer tests was demonstrated. A method for calculating well response time based on estimates of aquifer parameters and observation well dimensions also was presented to aid the proper design of aquifer tests. It was recommended that a slug test should be performed on every observation well used in confined or semiconfined aquifer tests. (Visocky-ISWS)

W78-01996

HYDROLOGY OF THE WAIKOROPUPU SPRINGS: A MAJOR TIDAL KARST RESURGENCE IN NORTHWEST NELSON (NEW ZEALAND)

University of Auckland (New Zealand). Dept. of Geography. P. W. Williams. Journal of Hydrology, Vol. 35, No. 1/2, p 73-92, October 1977. 8 fig, 1 tab, 30 ref.

Field 2—WATER CYCLE

Group 2F—Groundwater

Descriptors: *Springs, *Spring waters, *Discharge(Water), On-site investigations, Tides, Tidal effects, Coasts, Groundwater, Groundwater movement, Rivers, Infiltration, Recharge, Water quality, Saline water intrusion, Karst, Karst hydrology, Geology, Hydrogeology, Hydrology.
Identifiers: *New Zealand, *Waikoropupu Springs(New Zealand).

The Waikoropupu Springs with an average discharge of about 14 cu m/s are the largest springs in New Zealand. Water issues from 3 main sites at 14-17 m above sea level within a radius of 130 m of each other, the collected flow sustaining the Springs River. Previous study of their hydrology has been at reconnaissance level only. The Springs are karstic, tidal, brackish, and artesian in character, tritium data indicating a mean flow-through time of 3-4 years. The principal source of the Springs was demonstrated by pulse-train analysis to be the upper Takaka River that sinks into its gravelly bed 16-18 km to the south of the Springs and at 46-58 m above sea level. A mainly phreatic system is indicated because of the very low average gradient of the system, the descent of overlying confining beds to about sea level, and a rapid pulse-through time of 10 h for 20-km straight-line flow. The slightly saline waters of the Springs indicate a subterranean marine connection that is supported by the presence of submarine springs 1-5 km offshore, although the alternating double-amplitude tidal oscillation at the Waikoropupu Springs is more compatible with earth-tide influence. High tide at the Springs precedes high tide at sea by 0.5-1.5 h. Water discharge from the Waikoropupu Springs comes from four main sources: conduit flow of fresh-water through cavernous marble, diffuse percolation flow through marble, diffuse flow from overlying thick sands and gravels, and seawater intrusion. (Sims-ISWS)
W78-02000

2G. Water In Soils

STRUCTURAL INDICES OF IRRIGATED CALCAREOUS CHERNOZEM, (IN RUSSIAN), Kishinev Agricultural Inst. (USSR).
V. S. Snegovol.
Pochvovedenie 10, p 1320136, 1976.

Descriptors: *Soil moisture, Soil aggregates, *Calcareous soils, *Chernozems, Irrigated lands, Lucerne, Plowing, *Winter wheat.

The content of water-stable aggregates in the seed layer of soil was less than in the plowed layer. Structure coefficients of the soil were slightly higher in plowed soil than in surface tilled soil, after all forecrops (including winter wheat) except Lucerne. During the growing season soil structure improved.—Copyright 1977 Biological Abstracts, Inc.
W78-01705

SOME ASPECTS OF MOISTENING SURFACE FORMATION DURING SPRINKLING (SIMULATED TESTS), (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Soil Science.
E. A. Dmitriev.
Pochvovedenie 10, p 37-46, 1976.

Descriptors: *Soil moisture, *Sands, Moisture content, Rainfall, *Testing, *Sprinkling, Surface, Tests, Time.

In sands with particle size from 20-30 to < 70 mesh the imbibition of moisture occurs mainly through the pores, when sprinkling has an intensity up to 11 mm/min. The formation of tongues along the moistening front is connected with the variation of capillary pressure on the moistening surface. The amplitude of the depth of moistening grows with the increase of heterogeneity in the constitution of

the material, the decrease of its particle size, the lowering of rain intensity and the increase of the time of sprinkling.—Copyright 1977, Biological Abstracts, Inc.
W78-01706

DEVICE FOR MEASURING AMOUNT OF SOIL SPLASHED BY RAINDROPS, (IN RUSSIAN), G. K. Gorchichko.
Pochvovedenie 9, p 121-124, 1976.

Descriptors: Soils, Measurement, Rain, *Impact(Rainfall), Instrumentation, *Soil splashing, *Raindrops.

The construction and principles of a device measuring the total amount of soil splashed by raindrops are described. The device can be used to determine the amount of soil splashed up and down a slope and the height of soil particle flight.—Copyright 1977, Biological Abstracts, Inc.
W78-01709

MINERALOGICAL COMPOSITION OF THE COARSE-DISPERSED FRACTION IN HYDROMORPHIC SOILS OF THE DESERT ZONE, (IN RUSSIAN), Tashkent Univ. (USSR).
L. Tursunov, Kh. Tursunov, and A. Rasulov.
Probl Osv Pustyn' 5, p 30-38, 1976.

Descriptors: Deserts, Feldspar, *Hydromorphic soils, Irrigation, Rock, *Soils, USSR(Uzbek), *Mineralogy.

Relative accumulation of dusty fraction occurs during soil-forming processes in the Khorezm oasis (Uzbek, SSR, USSR) chronically exposed to irrigation and a complex of natural factors. Occurrence of finely dispersed particles is the result of destruction of elastic rocks, feldspars, micas (biotite and muscovite) and other minerals referring to coarse-dispersed fraction of soils.—Copyright 1977, Biological Abstracts, Inc.
W78-01710

PRINCIPLES, METHODS AND RESULTS OF DEFINING WATER-PHYSICAL PROPERTIES OF IRRIGATED SOIL IN ROMANIA, (IN RUSSIAN), Institutul de Cercetari pentru Pedologie si Agrochimie, Bucharest (Romania).
A. Kanarake, and R. Dumitriu.
Pochvovedenie 9, p 79-86, 1976.

Descriptors: *Soil physical properties, *Methodology, *Irrigated lands.
Identifiers: Cartograms(Soils), *Distribution, *Romania, Soils, Statistical methods.

A program and methods for characterizing water and physical soil properties on irrigated areas are presented. The data include: cartograms and tables of soil properties, grouped according to genetic types and subtypes, mechanical composition and physio-geographical distribution; correlations between studied properties; and some aspects of statistical data processing.—Copyright 1977 Biological Abstracts, Inc.
W78-01711

SETTING UP CROP ROTATION ON HYDROMORPHIC SOILS IN A MOIST CLIMATE, (IN GERMAN), Zagreb Univ. (Yugoslavia). Zavod Opcu Proizvode Bilja.
For primary bibliographic entry see Field 3F.
W78-01712

UNDERGROUND PART OF THE GRASS MIXTURE IN IRRIGATED PASTURES OF THE

HILLY RELIEF IN THE LITHUANIAN SSR, (IN RUSSIAN), Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 3F.
W78-01713

ZOOLOGICAL CHARACTERISTICS OF PRIMITIVE SOILS IN DRAINED ZONES OF SALT LAKES IN SOUTH SIBERIA, (IN RUSSIAN), Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
V. G. Mordkovich.
Zool Zh. 52(9), p 1321-1329, 1973.

Descriptors: *Salt lakes, Soils, Drainage, Salts, Seasonal, Aeration, Ecology, Insects, Inundation, Lakes, Plant populations, *USSR(South Siberia), *Drained soils.

The initial stages of succession in the drained zones of Siberian (USSR) lakes proceed at a tremendous rate. The density of animal population, its systematic composition and the character of its influence on soil drastically change during 1 season. Communities of different age arise on the territory gradually freed from water during 1 season. Amphibions-saprophaga occurring in the lake residues predominate at the water edge. The terrestrial fossorial insects predominate in the drained zone remote from the water. They aerate the lifeless saline soil thus promoting the development of plant cover. Unequal effects of fossorial insects on different regions of the drained zone serve as a basis for microcomplexes of soil-plant cover. There are many common systematic, morphological, autecological and synecological features of the population of drained zones in salt lakes of remote regions of Siberia and outer seas. This is due to past connections between basins and the conservative leveling effect of voeremoistenig, periodic inundation and salinization. Regional differences appear only at the last stages of saline soil development in drained zones.—Copyright 1974, Biological Abstracts, Inc.
W78-01917

PRACTICAL ASPECTS OF STRUCTURE DETERIORATION DUE TO AIR EXPLOSION, Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers.
F. F. R. Koenigs.
Meded Fac Landbouwwet Rijksuniv Gent. 37(3), p 1086-1094, 1972.

Descriptors: *Soil aggregates, *Porosity, *Air pressure, Pores, *Tensile strength, Occlusion.

The maximum air pressure occurring during wetting of dry soil aggregates is highly dependent on water occlusion of soil areas with small air-filled pores. In the field explosion does not occur if the rain intensity and duration are not greater than the sorptivity of the fine pores. Very small aggregates may be saturated by a single drop of water and explode while larger aggregates tend to be more stable. Tensile strength of aggregates approaching saturation is important.—Copyright 1974, Biological Abstracts, Inc.
W78-01940

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN), Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung.
For primary bibliographic entry see Field 2I.
W78-02013

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL, Utah Center for Water Resources Research, Logan; and Consortium for International Development, Logan, UT.

For primary bibliographic entry see Field 3C.
W78-02018

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIPARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA).
For primary bibliographic entry see Field 5B.
W78-02056

OXYGEN UTILIZATION IN SOILS FLOODED WITH SEWAGE WATER.
Agricultural Research Service, Phoenix, AZ.
Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W78-02194

2H. Lakes

ON THE BIOLOGY OF THE CLADOCERAN HOLOPEIDIUM GIBBERUM ZADDACH IN WINDGFAELLWEIHER (BLACK FOREST) (IN GERMAN).
Freiburg Univ. (West Germany). Limnologisches Inst.
W. Lampert, and K. Irmgard.
Arch Hydrobiol Supplementb 48(2), p 262-286, 1976.

Descriptors: Biomass, Lakes, *Crustaceans, Biology, Seasonal, Plankton, *Sampling, *Black Forest (West Germany), *Dystrophic lakes, *Holopedium-gibberum, *Windfaellweier (W Germany).

The annual population cycle of *H. gibberum* was studied by quantitative plankton sampling in Windgfaellweier, a small dystrophic lake in the Black Forest (West Germany). The maxima for abundance and biomass were found in June, reaching 152,000 Ind./individuals/m² or 520 mg C/m², respectively. A relationship between length and C of preserved Holopedium is presented. The seasonal cycle was unusual in that the animals had 2 periods of resting egg production in June and Oct. A notable percentage of males appeared only during the autumn. As a consequence of the fact that in June, 90% of all eggs were resting eggs, the instantaneous birth rate decreased markedly and the population size dropped at the end of July. This was clearly seen from the detailed size frequency distribution of the population. In early spring the abundance of resting eggs on the lake bottom was investigated by quantitative sampling. The maximum was 290 eggs/cm² in the center of the lake. Resting eggs isolated from the sediment developed quickly. Hatching rates of up to 80% could be obtained.—Copyright 1977, Biological Abstracts, Inc.
W78-01703

UTILIZATION OF MANGROVES: I, (IN FRENCH).
B. Rollet.
J Agric Trop Bot Appl 22(7-9), p 203-235, 1975.

Descriptors: Agriculture, *Ecology, Fishery, Food, *Mangroves, Medicine, *Bibliographies.

An analysis was made of a large unpublished bibliography on the uses of various mangroves and their ecological systems. This part discusses the present and former uses as food, as medicine, in agriculture, in horticulture, and in fishery; miscellaneous applications are also given.—Copyright 1977, Biological Abstracts, Inc.
W78-01708

POSSIBILITY OF USING AMMONIUM PERCHLORATE FOR ACCELERATING GROWTH OF CARP IN PONDS, (IN RUSSIAN).
F. P. Chork, A. M. Zelenin, G. I. Blk, and E. V. Kozhokaru.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk 2, p 54-57, 1975.

Descriptors: Fish reproduction, Fisheries, *Ammonium perchlorate, Animal growth, Aquarium, *Carp, *Growth rates, Metab-drug, Ponds.

The results of using ammonium perchlorate (APC) as an additive to mixed feed for carp are presented. The experiments were carried out in aquariums and ponds. APC has biological activity on fish, just as on other animals. Feeding fish with an addition of APC at a rate of 60 g/ton of mixed feed increased the weight gain of the carp by at least 25% with a simultaneous 15% decrease of the consumption of feed per unit weight gain. The use of APC in carp fishery will make it possible to increase the fish production of ponds by 150-200 kg/ha.—Copyright 1976, Biological Abstracts, Inc.
W78-01723

FECUNDITY IN CHOSEN FISH SPECIES FROM A FEW MAZURIAN LAKES PREPARED FOR EXPERIMENTAL FERTILIZATION, (IN POLISH).
Instytut Rybactwa Środladowego, Olsztyn-Kortowo (Poland). Zakład Gospodarki Jeziorowej.
W. Bialokoz.
Rocz Nauk Roln Ser H Rybactwo 95(4), p 7-34, 1974.

Descriptors: Lakes, *Mineralogy, Abramis brama, Alburnus alburnus, Esox lucius, Fecundity, *Fertilization, Fish, Leucaspis delineatus, Mazurian, Perca fluviatilis, *Poland (Magurian lakes), Rutilus.

Six fish species (*Abramis brama*, *Rutilus rutilus*, *Esox lucius*, *Perca fluviatilis*, *Leucaspis delineatus*, *Alburnus alburnus*) from 5 lakes of the Mazurian Lake District (Poland) were investigated. The lakes had been prepared for experimental mineral fertilization. Fish populations were tested immediately prior to fertilizing the lakes. Individual fecundity both absolute and relative was determined. The highest absolute fecundity was found in the fish from Lake Czarna Kuta, and the lowest in those from Lakes Smolak and Piecok.—Copyright 1976, Biological Abstracts, Inc.
W78-01734

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).
For primary bibliographic entry see Field 6E.
W78-01748

FISH PRODUCTIVITY OF VOLGA RESERVOIRS AND WAYS TO INCREASE IT UNDER COMPLEX UTILIZATION OF WATER RESOURCES, (IN RUSSIAN).
For primary bibliographic entry see Field 5C.
W78-01777

KEY TO THE CHAROPHYTES OF SOUTH AFRICA.
Rhode Island Univ., Kingston. Dept. of Botany.
R. D. Wood.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 47-49, 1976, 4 ref.

Descriptors: Species identification, Aquatic plants, Taxonomy, Submerged aquatic vegetation, Freshwater algae, Lakes, Lagoons, *Charophyceae, Characeae, Chara, Lamprothamnium, Tolypella, Nitella, Wilderness lakes, *South Africa.

Charophytes occur commonly in the less polluted vleis, dams, lagoons, and streams in South Africa. They form large populations in certain vleis such as in the Wilderness area, C.P. Many historically rich collecting areas, however, have been levelled through urbanization. A key for the identification of fresh and preserved specimens is given. (So African Water Info Center)
W78-01825

SOME LIMNOLOGICAL PROPERTIES OF AN EPHEMERAL WATERBODY AT SOSSUS VLEI, NAMIB DESERT, SOUTH WEST AFRICA.
Orange Free State Univ., Bloemfontein (South Africa). Inst. of Environmental Science.
J. U. Grobbelaar.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 51-54, 1976, 2 tab, 3 fig, 11 ref.

Descriptors: *Limnology, *Ephemeral streams, Hydrochemistry, Water analysis, Primary production, Biota, Chemical composition, Phytoplankton, Species diversity, Climatic data, Standing water, Calcium, Sodium, Groundwater, Ionic composition, Chemical properties, Colorimetry, Atomic absorption, *Sossus Vlei, *South West Africa, Namib Desert, South Africa, Spirogyra, Kuiseb River, Tsauchab River.

Sossus Vlei (24 degrees 45'S, 15 degrees 20'E), which is situated 55 km from the coast at the river-terminating of the Tsauchab River, consists mainly of old river sediments covered by south-north moving sand dunes, which have blocked the river course and divided the vlei up into several arms or lobes. The present day vlei has an area of about 15 km² and although sparsely vegetated the vlei appears lush between the seemingly barren dunes. *Acacia giraffae*, scrubby halophytic *Chenopodiaceae*, spiny *Stipagrostis* grasses and the endemic scrub *narras* (*Acanthosicyos horrida*) are some of the plants that vegetate the vlei. Although the headwaters of the Tsauchab River are in the Naukluft Mountains, where the maximum annual rainfall is approximately 200 mm, water reaches Sossus Vlei only after exceptionally heavy rainfall periods. Open water is relatively rare in the vlei and soon disappears. The only standing water at the Vlei during the visits, was a shallow (maximum depth of 0.35 m) pond with a surface area of approximately 20 000 m². This pond is surrounded by high sand dunes, except to the south where it links with the vlei. The bottom sediments are soft and clayey, leaving extensive mudcrack areas where the water has retreated. Aspects of the water chemistry, primary production and biota were studied. The chemical composition of the water was dominated by NaHCO₃ and an edaphic rather than an oceanic origin is shown, where the source water had lost its Ca through precipitation of CaCO₃ due to a pH shift. The phytoplankton was dominated by *Spirogyra* spp. which settled to the bottom during calm conditions, rendering low primary production values of the water column. A small species diversity exists, which is attributed to the isolation and temporariness of the pond. (So African Water Info Center)
W78-01826

VARIATION OF 'GILL' SIZE IN LARVAE OF THE AFRICAN MIDGE CHIRONOMUS TRANSVAALENSIS KIEFFER.
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
A. J. McLachlan.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 55-56, 1976.

Descriptors: *Aquatic insects, *Insect larvae, Limnology, Gills, Salinity, Species identification, Water quality, Water pollution, Morphological changes, *Midges, *Septematics, *Chironomus transvaalensis, Chironomidae, *Africa, South Africa.

Field 2—WATER CYCLE

Group 2H—Lakes

Larvae of *Chironomus* are common inhabitants of newly flooded lakes and polluted and temporary waters in Africa. These habitats characteristically undergo wide variations in the content of dissolved salts. The so-called 'gills' (comprising conspicuous anal papillae and abdominal tubuli) are proving to be attractive to African taxonomists as characters of separation of species. Evidence from laboratory experiments is presented to show that in one common species, *Chironomus transvaalensis* Kieffer, both types of 'gill' vary in size depending upon the concentration of inorganic ions in the water. The variation is such as to cast serious doubt on the taxonomic value of the 'gills'. (So African Water Info Center)
W78-01827

ON THE SIZE REACHED BY CLARIAS GARIEPINUS, Institute for Freshwater Studies, Ubombo (South Africa). Lake Sibaya Research Station. M. N. Bruton. Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 57-58, 1976. 2 tab, 23 ref.

Descriptors: Freshwater fish, *Fish populations, Food chains, Body size, Body length, Body weight, Predator-prey relationships, *Clarias gariepinus, *Siluroidea, *South Africa.

The suborder Siluroidea includes some of the largest freshwater fishes in the world. Among them are the wels *Silurus glanis* from eastern Europe and western Russia which exceeded 400 cm and 270 kg and Amazonian catfish *Arapaima gigas* and *Brachyplatystoma* spp., which exceed 300 cm and 100 kg. Two giant catfish occur in southern Africa. The largest is the vundu *Heterobranchius longifilis* Cuvier and Valenciennes, 1840, which is distributed from the Nile and Congo basins southwards to the Zambezi river and reaches 47 628 kg. Vundu commonly exceed 30 kg and there are unconfirmed reports of specimens weighing over 100 kg. The second largest is the sharptooth catfish *Clarias gariepinus* distributed from the Zambezi to the Umtamvuma rivers, which is the Republic of South Africa's largest freshwater fish. The size reached by *Clarias gariepinus*, both past and present, is reviewed from available records. The sharptooth catfish is the Republic of South Africa's largest freshwater fish and may reach its greatest size in rivers and dams with a plentiful supply of fish prey to adults. (So African Water Info Center)
W78-01828

THE BIOLOGY OF BARBERSPAN, WITH SPECIAL REFERENCE TO THE AVIFAUNA, Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation. For primary bibliographic entry see Field 6G.
W78-01832

CHANGES IN SOME BIOCHEMICAL INDICES OF BREEM KEPT IN RESERVOIRS, (IN RUSSIAN), Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany. A. Kangur, and A. Kirsipuu. Eesti Nsv Tead Akad Toim Biol 25(3), p 176-187, 1976.

Descriptors: *Bioindicators, *Biochemical indices(Fish), *Bream, *Metabolism(Fish), Reservoirs, Seasonal.

According to data collected during 1964-1973, the manner of catching, the injuries caused by catching and the conditions of maintenance affect the biochemical indices of the muscle, blood and liver. In the period of low activity Jan.-Feb., keeping the fish for a short time in warm water in a reservoir affects the biochemical indices very little. But in the period of intensified activity (in summer) even a brief period of unfavorable condi-

tions causes remarkable deviations in the metabolic cycle. During reorganization of metabolic processes (spring and autumn), the conditions either accelerate or inhibit the natural course of metabolic processes. The remarkable variability of the biochemical indices in the fish kept in a reservoir or in a live-box shows that the process of adaptation is of an individual nature. Complete adaptation of the bream requires no less than 5-7 days.—Copyright 1977, Biological Abstracts, Inc.
W78-01891

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS, Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B.
W78-01907

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE, North Dakota Univ., Grand Forks. Dept. of Biology. For primary bibliographic entry see Field 5C.
W78-01909

ZOOPLANKTON IN FRY PONDS IN THE LUBLIN VOIVODSHIP, (IN POLISH), Akademia Rolnicza, Lublin (Poland). Inst. Biol. Rodstaw Prod. Zwierzece. B. Jarzynowa. Roczn Nauk Roln Ser H Rybactwo 95(4), p 69-84, 1974.

Descriptors: Crustaceans, Fisheries, Fry, Plankton, *Poland(Voivodship), Ponds, *Zooplankton.

The results of zooplankton testing in the nursery ponds of a State Fish Farm, in the Voivodship of Lublin (Poland) are given. The ponds were tested for qualitative and quantitative occurrence of zooplankton. In experiments conducted for several years, the fauna in the same ponds were analyzed. Peculiar attention was paid to Cladocera.—Copyright 1976, Biological Abstracts, Inc.
W78-01914

ZOOLOGICAL CHARACTERISTICS OF PRIMITIVE SOILS IN DRAINED ZONES OF SALT LAKES IN SOUTH SIBERIA, (IN RUSSIAN), Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry. For primary bibliographic entry see Field 2G.
W78-01917

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER, Southwest Texas State Univ., San Marcos. Aquatic Station. For primary bibliographic entry see Field 5C.
W78-01920

THE EXPLOSIVE OCCURRENCE OF THE FRESHWATER MEDUSA, LIMNOCNIDA TANGANYICA GUNTHER, IN LAKE KARIBA DURING 1972, Rhodesia Univ., Salisbury. Div. of Biological Sciences. M. L. Mills. Arnoldia Rhod. 6(14), p 1-8, 1973.

Descriptors: Lakes, Limnocythid tanganyicae, *Medusa, *Rhodesia(Lake Kariba).

A brief outline of the history of the medusa is given. The present lines of thought on species distinction are mentioned. A report is given of a shortlived population 'explosion' of the medusa, seemingly with a single focus of origin in the

Sinamwenda area of Lake Kariba, Rhodesia.—Copyright 1974, Biological Abstracts, Inc.
W78-01936

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN I. EFFECTS OF PHYTOPLANKTON, Saint Andrews Univ. (Scotland). Dept. of Botany. For primary bibliographic entry see Field 5C.
W78-01942

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE, Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. For primary bibliographic entry see Field 5A.
W78-01947

LOCH EWE BAG EXPERIMENT, 1974, Marine Lab., Aberdeen (Scotland). For primary bibliographic entry see Field 5C.
W78-01954

THE RELATIONSHIP BETWEEN PLANKTONIC ALGAE AND BACTERIA IN SMALL LAKE, Alberta Univ., Edmonton. Dept. of Botany. For primary bibliographic entry see Field 5C.
W78-01960

OXYGEN DEFICITS, CLARITY, AND EUTROPHICATION IN SOME MADISON LAKES, State Univ. of New York at Buffalo. Dept. of Biology. For primary bibliographic entry see Field 5C.
W78-01966

TOXIC EFFECTS OF CADMIUM ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTINALIS), Environmental Research Lab., Duluth, MN. For primary bibliographic entry see Field 5C.
W78-01969

LAKE TAHOE GEOCHEMICAL STUDY. I. LAKE CHEMISTRY AND TRITIUM MIXING STUDY, Scripps Institution of Oceanography, La Jolla, CA. For primary bibliographic entry see Field 5A.
W78-01978

OBSERVED RESULTANT CIRCULATION OF LAKE ONTARIO, National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab. R. L. Pickett, and S. Bermick. Limnology and Oceanography, Vol. 22, No. 6, p 1071-1076, November 1977. 4 fig, 1 tab, 13 ref.

Descriptors: *Water circulation, *Currents(Water), *Lake Ontario, *Great Lakes, Winds, Summer, Winter, Flow, Lakes, Circulation, Frequency analysis, Energy, Data processing, Limnology. Identifiers: Gyres.

Vector-averaged current data from June-October 1972 suggested that Lake Ontario's resultant circulation during the stratified period consists of a dominant counterclockwise gyre together with a small clockwise gyre in the northwest portion of the lake. Current speeds are lowest in spring and have maximum vertical shear in early autumn. Spectra comparing summer and winter winds and currents showed more high frequency energy in summer winds and currents and more low frequency energy in winter winds and currents. (Sims-LSWS)

WATER CYCLE—Field 2

Water In Plants—Group 21

W78-01979

THE THERMAL STRUCTURE OF THE DEAD SEA.
Weizmann Inst. of Science, Rehovoth (Israel).
Dept. of Applied Mathematics.
Z. Ben-Avraham, R. Hanel, and G. Assaf.
Limnology and Oceanography, Vol. 22, No. 6, p 1076-1078, November 1977. 1 fig, 1 tab, 8 ref.

Descriptors: *Thermal properties, *Physical properties, Geothermal studies, *Water temperature, *Thermal stratification, Properties, Thermometers, Instrumentation, Saline water, Surface water, Analytical techniques.
Identifiers: *Dead Sea, *Thermal structure, *Israel, *Thermal profile.

The thermal structure of the Dead Sea was measured with a sensitive probe (0.002°C accuracy). The Dead Sea displays a horizontal uniformity below a depth of about 100 m. An adiabatic temperature distribution was found from the bottom (335 m) to a depth of 185 m. (Henley-ISWS)
W78-01980

GREAT LAKES ICE THICKNESS PREDICTION.
National Oceanic Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W78-01983

NEARSHORE SEDIMENTS OF THE ILLINOIS SHORE OF LAKE MICHIGAN.
Illinois Univ. at Urbana-Champaign. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-01984

SEDIMENTATION RATES AND A SEDIMENT BUDGET FOR LAKE ONTARIO.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-01985

CALCULATION OF STEADY CURRENTS IN LAKE ONTARIO WITH VARIABLE EDDY VISCOSITY.
Oak Ridge National Lab. TN.
A. J. Witten, and J. H. Thomas.
Journal of Great Lakes Research, Vol. 2, No. 2, p 357-363, December 1976. 6 fig, 1 tab, 10 ref. NSF DES72-01338 A03.

Descriptors: *Currents(Water), *Lake Ontario, *Model studies, *Great Lakes, Mathematical models, Winds, Circulation, Water circulation, Lakes, Flow, On-site data collections, Limnology.
Identifiers: Eddy viscosity, Lake circulation.

A theory of steady wind-induced currents with depth dependent eddy viscosity was applied to Lake Ontario with accurate topographic representation. In this theory, the eddy viscosity has the form $v = (v_{sub} o) e^{to the az power}$, where $v_{sub} o$ and a are constants, and z is the vertical coordinate measured upward from the undisturbed free surface. Results were presented for a uniform wind from the west and were compared with previous results for a constant eddy viscosity as well as current measurements made in Lake Ontario during IFYGL. The study showed that, while the vertically integrated mass flux is insensitive to variations in the eddy viscosity, the three-dimensional currents are sensitive to the variations. Although the irregular bottom topography of Lake Ontario strongly influences the current pattern, the nature of the coastal jets, return flow, and upwelling and downwelling are characteristic of the exponential eddy viscosity. (Sims-ISWS)
W78-01987

TURBIDITY SOURCES IN LAKE SUPERIOR.
Minnesota Univ.-Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2J.
W78-01988

CURRENTS AND CONTAMINANT DISPERSION IN THE NEARSHORE REGION AND MODIFICATION BY A JETPORT.
Case Western Reserve Univ., Cleveland, OH
Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W78-01989

THERMAL DISCHARGE FROM A NUCLEAR POWER PLANT: PREDICTED EFFECTS ON LAKE ERIE FISH.
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-02002

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: II. ADDITIONAL FEATURES OF THE CHEMISTRY OF MACQUARIE ISLAND LAKES AND TARNs.
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K.
W78-02004

TULAREMIA EPIZOOTICS IN THE FLOOD PLAIN-SWAMP FOCI OF WEST SIBERIA AND COMPARATIVE ESTIMATION OF DIFFERENT METHODS OF THEIR STUDY. (IN RUSSIAN).
Akademiya Meditsinskikh Nauk SSSR, Moscow.
Dept. of Nature and Focus Infection.
For primary bibliographic entry see Field 2I.
W78-02009

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN.
Environmental Protection Agency, Chicago, IL.
Office of Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-02017

THE LAKE CHELAN CASE--ANOTHER VIEW.
Washington State Bar Association, Seattle.
For primary bibliographic entry see Field 6E.
W78-02098

WISCONSIN DESMIDS. III. DESMID COMMUNITY COMPOSITION AND DISTRIBUTION IN RELATION TO LAKE TYPE AND WATER CHEMISTRY.
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-02122

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER.
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 5C.
W78-02183

COMPETITIVE INHIBITION FOR AMINO ACID UPTAKE BY THE INDIGENOUS MICROFLORA OF UPPER KLAMATH LAKE.
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 5C.
W78-02187

THE INTERACTION OF COMPONENTS CONTROLLING NET PHYTOPLANKTON

PHOTOSYNTHESIS IN A WELL-MIXED LAKE (LOUGH NEAGH, NORTHERN IRELAND).
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.
For primary bibliographic entry see Field 5C.
W78-02195

PRIMARY PRODUCTIVITY AND FISH YIELDS IN TROPICAL LAKES.
Duke Univ., Durham, NC. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-02199

2I. Water In Plants

RELATIVE ABUNDANCE OF WATERFOWL IN THE ORANGE FREE STATE.
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Nature Conservation.
For primary bibliographic entry see Field 6G.
W78-01843

VEGETATION PATTERNS ON A SOUTHERN APPALACHIAN WATERSHED.
Old Dominion Univ., Norfolk, VA. Dept. of Biology.
F. P. Day, Jr.
Ecology, 55(5), 1064-1074, 1974.

Descriptors: Forests, *Forest management, Acer rubrum, *Appalachian Mountain region, Betula lutea, Biomass, Blight, Carya glabra, Chestnut, Cornus florida, Hamamelis virginiana, Kalmia latifolia, Liriodendron tulipifera, Moisture, Nyssa sylvatica, Oxydendron arboreum, Quercus coccineus, Quercus prinus, Rhododendron maximum, Soils, Topography, Tsuga canadensis, *Vegetation, *Watersheds(Basins).

The vegetation on a relatively undisturbed hardwood forest watershed at Coweeta Hydrologic Laboratory, Franklin, North Carolina was sampled, and estimates of density, basal area and above-ground biomass were computed. These vegetational parameters and 5 topographic variables (elevation, aspect, slope angle, distance from stream channel, and distance from water divide) were used to analyze site-species relationships on the watershed. The primary analytical techniques used were correlation analysis and principal components ordination. Major changes in the vegetation since the introduction of chestnut blight were also examined. The vegetation on the watershed was found to be dominated by oaks, though considerable change had occurred in the vegetation composition since the appearance of chestnut blight. Total basal area on the watershed was 25.6 m²/ha and the total aboveground biomass was 139, 900 kg/ha. Significant correlations were found between 13 major species (*Quercus prinus*, *Q. coccineus*, *Carya glabra*, *Liriodendron tulipifera*, *Betula lutea*, *Tsuga canadensis*, *Acer rubrum*, *Oxydendron arboreum*, *Kalmia latifolia*, *Rhododendron maximum*, *Cornus florida*, *Nyssa sylvatica*, *Hamamelis virginiana*) and one or more of the topographic variables. The ordination results revealed species groupings related to the correlation results. Distance from the stream, distance from the water divide and elevation, which produce a soil moisture gradient, were the important topographic factors determining species distribution at Coweeta.—Copyright 1975, Biological Abstracts, Inc.
W78-01943

ESTIMATION OF THE TOTAL POPULATIONS OF LARVAE OF AEDES (O.) CATAPHYLLA DYAR 1916 (DIPTERA, CULICIDAE): II. METHOD USING THE 'SCOOPE' WITH THE LADLE' OR 'DIPPING'. (IN FRENCH).
Montpellier-1 Univ. (France). Faculté de Médecine.
B. Papieron, H. Croset, and J. A. Rioux.

Field 2—WATER CYCLE

Group 21—Water In Plants

Cah O R S T O M Ser Entomol Med Parasitol. 13(1), p 47-51, 1975.

Descriptors: Estimating, Biological communities, Biocontrol, Methodology, *Aedes-cataphylla, *Culicidae, *Dipping method, *Diptera, Larvae.

A larval population of *Aedes* (*Ochlerotatus*) *cataphylla* Dyar, 1916 was counted using the dipping method. Using according to an accurate protocol, dipping gives results similar with those obtained by the mark-recapture method so that it is possible to consider the dipping as an absolute sampling method. This easy to apply method opens numerous possibilities for the study of the dynamics of culicid populations, preliminary to the promotion of biological control methods.—Copyright 1976, Biological Abstracts, Inc. W78-01950

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY.

Massachusetts Univ., Boston. Dept. of Biology. B. A. Menge. Ecological Monographs, Vol 46, No 4, p 355-393, 1976. 17 fig, 16 tab, 71 ref, 2 append. NSF GA-35617 and DES72-01578 A01.

Descriptors: *Ecology, *Intertidal areas, *Biological communities, *Predation, *Competition, *Heterogeneity, New England, Maine, Massachusetts, Gastropods, Mussels, Ecosystems, Aquatic habitats, Habitats, Algae. Identifiers: Community structure, Balanus balanoides, Mytilus edulis, Thais lapillus, Fucus, Barnacles, Fucoid algae.

Community structure at six sites along the rocky intertidal shores of Maine and Massachusetts was studied from 1972-75 using a combined comparative and experimental approach. The roles of competition for space, predation, and substratum inclination and heterogeneity were examined, as well as factors responsible for the distinct species zoning patterns and the effects of disturbances by fucoid algae and herbivorous snails. Numerically dominant species in these simple communities include barnacles (*Balanus balanoides*), mussels (*Mytilus edulis*), herbivorous gastropods (*Littorina saxatilis*, *L. obtusata*, *L. littorea*, and *Acmaea testudinalis*), carnivorous snails (*Thais lapillus*), and fucoid algae (*Fucus distichus*, *F. vesiculosus*, and *Ascophyllum nodosum*). Community structure in the high intertidal zone (3.7-1.8 m above mean low water) is a function of *Balanus* population dynamics. *Balanus* space utilization is affected most by intraspecific competition, wave shock, and desiccation, rather than by *Thais* predation or competition with *Mytilus*, except in protected areas. The structure of the mid-intertidal (1.8-0.6 m above low water) is a complex function of predation, competition, structural heterogeneity, biological disturbance from the fucoid canopy, and wave shock. Competition between *Mytilus* and *Balanus* is the major factor; substratum inclination affects their relative density. With decreasing wave shock, predation on *Mytilus* and *Balanus* increases and interspecific competition decreases. (Lynch-Wisconsin) W78-01952

CONTRIBUTION TO THE KNOWLEDGE OF THE BIOLOGY OF FISHES OF AMAZONIA: II. FOOD HABITS OF THE TAMBAQUI, COLOSSOMA BIDENTES (SPIX), (IN PORTUGUESE).

Instituto Nacional de Pesquisas de Amazonia, Manaus (Brazil). E. M. S. Honda.

Acta Amazonica. 4(2), p 47-54, 1974.

Descriptors: *Fish biology, *Food habits(Fish), Seasonal, *Brazil(Amazonia), *Byrsonima* sp., Cladocera, *Colossoma bidentes, Copepods, *Duroia duckei*, *Gustavia augusta*, *Hevea brasiliensis*,

Hevea spruceana, *Mabea caudata*, Ostracod, Plankton, *Simaba guianensis*, *Tabebuia* sp., *Tambaqui.

The results of qualitative and quantitative analysis of the stomach contents of tambaqui, *C. bidentes* (Spix), collected in Lago do Castanho, Amazonas (Brazil), were related to standard length of the specimens and to the months of the year. There is a periodic variation in the alimentation of this fish. Fruits are constantly present during the high water season, but are increasingly rare as the volume of water decreases. The following fruits occur most frequently: araca, *Duroia duckei* Huber; cajurana, *Simaba guianensis* (Aubl.); capitari, *Tabebuia* sp.; murao, *Gustavia augusta* L.; muruxi, *Byrsonima* sp.; seringa, *Hevea brasiliensis* M. Arg.; seringa barriguda, *H. spruceana* M. Arg.; and taquari, *Mabea caudata*, P. et H. Planktonic crustaceans are another common food of tambaqui, predominantly during the dry season. Cladocerans, copepods and ostracods occur most frequently. In regard to fish size, the presence of fruit in the stomach was greater in individuals of more than 600 mm and the micro-crustaceans were found in all of the specimens examined. An examination of the branchial structure of tambaqui showed the fish to be adapted for feeding on plankton. The strong teeth also indicated the capacity to break the stones of fruit. These findings indicate that the tambaqui is omnivorous.—Copyright 1975, Biological Abstracts, Inc. W78-01953

TROPICAL BLACKWATER RIVERS, ANIMALS, AND MAST FRUITING BY THE DIPTEROCARPACEAE.

Michigan Univ., Ann Arbor. Dept. of Zoology. D. H. Janzen.

Biotropica. 6(2), p 69-103, 1974. Descriptors: *Toxicity, *Animals, Asia, *Blackwater rivers, Climates, *Dipterocarpaceae, *Mast fruiting, Nutrition, Primary productivity, Rivers, Sarawak, Seeds, Trees, Tropical, Vegetation.

It is proposed that tropical nutrient-poor white sand soils produce blackwater rivers, rivers that are rich in humic acids and poor in nutrients, because the vegetation growing on these soils is exceptionally rich in secondary compounds. While the water and the soil (including litter) may be expected to have a low productivity and animal biomass solely on the basis of its low nutrient content, it is possible that large amounts of secondary compounds are also debilitating to the animal community. An exceptionally high concentration of secondary compounds is expected in the vegetation growing on white sand soils for 2 reasons. First, this is an expected outcome in habitats where the loss of a leaf to an herbivore or through deciduous behavior is a relatively greater loss than on nutrient-rich soils. Second, the plants belong for the most part to families rich in secondary compounds. The small amount of data that is available from Sarawak white sand habitats shows that the carrying capacity for animals is very greatly reduced. The postulated cause of reduced primary productivity and/or much of the productivity being used by the plant for secondary compounds (unharvestable productivity), or stored for seed crops at very long intervals (unavailable productivity). Mass fruiting at the community level, as displayed by trees in the Dipterocarpaceae, is a mechanism of escape from seed predators that is unique to S.E. Asia because this area has reduced animal communities and because the climate is sufficiently uniform for such an intra- and inter-population cueing system to evolve. Without experimentation, it is impossible to know if the animal community is reduced solely due to overall lowered primary and harvestable productivity, or as well to the inevitable reduction in animal numbers when many of the trees in a habitat wait more than a few years for their highly synchronized seed crops. The occurrence of nu-

merous tropical habitats with a very low diversity of trees violates the dogma that diversity is mandatory for stability in tropical habitats. The trees in such monotonous habitats are exceptionally well-protected chemically with respect to foliage, and have either very toxic seeds or well-developed mast cycles.—Copyright 1974, Biological Abstracts, Inc. W78-02006

TULAREMIA EPIZOOTICS IN THE FLOOD PLAIN-SWAMP FOCI OF WEST SIBERIA AND COMPARATIVE ESTIMATION OF DIFFERENT METHODS OF THEIR STUDY, (IN RUSSIAN).

Academiya Meditsinskikh Nauk SSSR, Moscow. Dept. of Nature and Focus Infection.

Z. P. Dobrokhotoy, and I. S. Meshcheryakova.

Bull Zh 53(11), p 1686-1696, 1974.

Descriptors: *Flood plains, *Allactaga-bullata*, *Allactaga-elator*, *Allactaga-euphratica*, *Allactaga-jaculus*, *Allactaga-saltator*, *Allactaga-severtzovi*, *Allactagulus-acontion*, *Allactodipus-bobinskii*, Birds, *Epizootics, Floods, *Lophocricetus*, Novosibirsk, Oblast, Omsk, *Protolactaga*, *Pygerethmus-platyurus*, *Sicista*, *Swamps, *Tularemia, *USSR(West Siberia).

During the regular mass reproduction of water voles (*Lophocricetus*) in West Siberia (Novosibirsk and Omsk Oblasts, USSR) in summer 1971, epizootics of tularemia appeared and assumed a continuous pattern in 1972. A study of blood sera from wild animals little susceptible and non-sensitive to tularemia (*Allactodipus bobinskii*, *Allactaga jaculus*, *A. severtzovi*, *A. saltator*, *A. bullata*, *A. elator*, *A. euphratica*, *Allactagulus acontion*, *Pygerethmus platyurus*, *Sicista*, *Protolactaga*) showed the territorial distribution of the epizootic in the focus. The presence of hemagglutinating antibodies against the tularemia causative agent in the blood of 0.3-0.9% of water voles suggested the non-lethal course of infection in this species. It is necessary to decipher the mechanism of this phenomenon and the role of such specimens in the epizootic process. The method of epizootic detection by examining pellets of birds and excrement of predatory mammals can be successfully utilized in the flood plain-swamp foci of tularemia; this method enables more detailed characteristics of the spizootic process to be obtained at relatively small expenses of labor. The boundaries and intensity of even weak epizootics were established. The wide involvement of common voles in the circulation of the causative agent in the flood plain-swamp tularemia foci calls for more detailed study of their role in the maintenance of such foci.—Copyright 1975, Biological Abstracts, Inc. W78-02009

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN).

Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung.

K. Dierssen.

Res Inst Nedri As Hveragerdi Icel Rep. 13, p 1-30, 1973.

Descriptors: *Mosses, *Iceland, *Peat soils, *Aulacomnium-palustre*, *Ceratodon-purpureus*, Foodstuff, *Funaria-hygrometrica*, Hay, *Leptobryum-piriforme*, Limestone, Nitrogen, Peat, *Peltigera*, Phosphorus, *Pleurozium-schreberi*, *Pogonatum-unigerum*, *Pohlia-cruda*, *Polytrichum-alpinum*, *Psilopilum-laevigatum*.

Bryophyte communities forming pioneer vegetation on peat soil in Iceland are classified by phytosociological methods. The *Psilopilum laevigatum*-union grows on peat containing little of mineral matter. The *Pogonatum unigerum*-union is mainly to be found on loessial deposits or wind-transported mineral dusts in the peat, while the *Funaria hygrometrica*-community grows on layers

of volcanic ash (tephra) in the peat. In the agricultural field research institute at Hvanneyri, W. Iceland, investigations were undertaken to show relationships between bryophyte communities and the use of different fertilizers (N, P, limestone). Taking into account the concurrences between the Bryophytes and the herb layer, the mosses are direct indicators of the soil conditions and therefore can be used as mapping units for hayfields quality. Characteristic groups are easier to be found in the field by working out spectra of genera than by the single species without losing the characteristic relevance of the groups. It is even possible to point out relationships between the number of species in the different samplings and hay-production. The possibility of indicating chemical and physical soil conditions (such as water capacity, base saturation, fertilizer use, etc.) by the bryophyte vegetation is proposed. In agreement with Tuxen (1958), one can say that the bryophyte-units can be used not only as indicators, but also for quantitative measurements of factor complexes in the places under study. They may help to clear up cultivation problems in the Icelandic hayfields. An indicator for good drainage and high amount of nitrogen in the soil may be *Ceratodon purpureus*, but large populations indicate the possibility of damage by winter killing (kal). A relatively good base saturation is shown by *Funaria hygrometrica*, *Polia cruda* and *Leptobryum piliferum*. Soils with less N are characterized by different species of the lichen genus *Peltigera*, and also by *Aulacomnium palustre*, *Pogonatum urnigerum*, *Polytrichum alpinum* and *Pleurozium schreberi*. Bad base saturation and insufficient physical soil conditions are to be found where *Psilopilum laevigatum* is present in large quantities.—Copyright 1974, Biological Abstracts, Inc. W78-02013

GROWTH AND DEVELOPMENT OF JUGLANS REGIA IN FOREST-ORCHARDS AND IN PLANTATIONS, (IN RUSSIAN), V. M. Zhadan.

Tr Kishinev S-Kh Inst. 63, p 81-90, 1970.

Descriptors: Arid lands, Dogwood, *Forests, *Growth rates, *Juglans-Regia, Moisture content, Nutrition, Orchards, Plantations, Roots, Shrubs, Steppes, Transpiration, *USSR(Moldavia), *Walnut.

Under the conditions of Moldavia (USSR), *Juglans regia* trees planted in pure rows grow better than the stands with an admixture of shrubs. In order to clarify the causes of the poor growth and development of walnut in the latter, root systems (RS) were dug out in walnut trees and in dogwood (D) shrubs in the 6-yr-old plantations of the Yargara Forest Farm. Average weight of RS in walnut trees in 1769 kg (including 0.109 kg of roots < 3 mm), in D 2649 and 0.325 kg, respectively. In the 0-80 cm layer, 91.3% of walnut roots are concentrated, and 94.4% of D. In comparison with D, roots of walnut penetrate 120 cm deeper and reach the depth of 280 cm (1.8% by weight). Average weight of the epigeal part (the stem) of walnut is 2470 kg, that of D-4615 kg; fresh weight of walnut leaves is 788 g with a total surface of 3.76 m², whereas in D it is 1982 g and 13.85 m², respectively. Though transpiration intensity in D is considerably lower than in walnut, the total water expenditure on transpiration was higher in D. In all soil layers (except of 0-10 cm) moisture content provision was considerably higher when D was cut out. Therefore, the unsatisfactory growth of walnut is explained first of all by the deficiency of moisture, which is intercepted by a more developed fibrous RS of D. In a pure plantation of the same age, established under the same conditions by the plantation method, fresh weight of the epigeal part of walnut tree was 60 kg, weight of the RS was 16.25 kg, whereas the fruit yield was 200 kg/ha. The great difference between the growth and development of walnut in stands with the admixture of D, and in pure plantations is explained

by the difference in the nutrition area; in the 1st case it was 1.5 m², whereas in the 2nd case it was 24 m². Also discussed is the problem of the principle of establishing forest plantations on arid steppes. The introduction into forest-orchards of soil-shading undergrowth did not justify itself and the expenses for creating walnut plantations are only 36.2% of the cost of creating forest walnut plantations. In plantations one may expect an income as early as in the 1st years by growing tilled crops in the interrows, and by the age of 10-15 yr, walnut fruit in an amount not less than 500-600 kg/ha.—Copyright 1974, Biological Abstracts, Inc. W78-02014

STUDIES ON THE BROODING POPULATION OF LIMICOLAE IN THE LOWER HAVEL RIVER, (IN GERMAN), J.-J. Seeger.

Beitr Vogeld. 20(5), p 421-426, 1974.

Descriptors: Europe, *Brooding, Charadrius-dubius, *East Germany(Lower Havel River), Gallinago-gallinago, Haematopus-ostrealegus, *Limicola, Limosa-limosa, Numenius-arquata, Philomachus-pugnax, Rivers, Tringa-hypoleucos, Tringa-totanus, Vanellus-vanellus.

Between 1969-1972 broods of *Vanellus vanellus*, *Charadrius dubius*, *Gallinago gallinago*, *Numenius arquata*, *Limosa limosa*, *Tringa totanus* and *Philomachus pugnax* were reported and *T. hypoleucos* and *Haematopus ostrealegus* probably also breed in the lower Havel valley (East Germany). During spring floods large numbers of *V. vanellus*, *L. limosa*, *T. totanus* and *P. pugnax* brood and low spring flood levels reduce the number of brooding pairs. Polders in the area which have artificially induced extremely low water levels limit the breeding grounds of the lower Havel valley.—Copyright 1975, Biological Abstracts, Inc. W78-02158

2J. Erosion and Sedimentation

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY,

Texas Univ. at Dallas, Richardson. For primary bibliographic entry see Field 5G. W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE,

Miami Univ., FL. For primary bibliographic entry see Field 5G. W78-01779

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,

Cape Town Univ. (South Africa). For primary bibliographic entry see Field 2L. W78-01834

DISTRIBUTION OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,

Cape Town Univ. (South Africa). Dept. of Geology. For primary bibliographic entry see Field 2L. W78-01836

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,

Cape Town Univ. (South Africa). Dept. of Geochemistry. For primary bibliographic entry see Field 2L. W78-01842

RECONNAISSANCE OF SEDIMENTATION IN THE RIO PILCOMAYO BASIN, MAY 1975, ARGENTINA, BOLIVIA, AND PARAGUAY,

Geological Survey, Harrisburg, PA. Water Resources Div. J. R. Ritter. Open-file report 77-327, 1977. 34 p, 20 fig, 1 plate, 2 tab, 9 ref.

Descriptors: *Sediment transport, *Sedimentation, *Sediment distribution, *Sedimentation rates, *Foreign countries, Stream-flow, Sediment discharge, Data collections, Pre-impoundment, Dams, Irrigation design, Design criteria, *Argentina, *Bolivia, *Paraguay, *Rio Pilcomayo basin.

The Rio Pilcomayo 'Alto' (Bolivia) and 'Superior' (Bolivia, Argentina, and Paraguay) transport large quantities of sediment for the size of the basin. The Rio Pilcomayo 'Inferior' (Argentina and Paraguay) carries little sediment. The large loads of the 'Alto' and 'Superior' must be considered before dams or irrigation projects are started. The shifting channel and flooding of the Rio Pilcomayo 'Superior' also are problems to be considered before development. The Rio Pilcomayo 'Alto' basin has relatively little sediment deposition whereas the 'Superior' basin has considerable deposition. A part of the 'Superior' channel is filled with sediment to the top of its banks. The upstream limit of filling is moving farther upstream each year causing the place of overbank flooding to move upstream also. (Woodard-USGS) W78-01862

1976 BEDLOAD MEASUREMENTS, EAST FORK RIVER, WYOMING,

Geological Survey, Berkeley, CA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div. L. B. Leopold, and W. W. Emmett. In: Proceedings of the National Academy of Sciences, Vol 74, No 7, p 2644-2648, July 1977. 3 tab, 1 ref.

Descriptors: *Sediment transport, *Bed load, *Fluvial sediments, Sedimentation rates, Geomorphology, Channel morphology, Sediment distribution, Analytical techniques, Measurement, Flow rates, *East Fork River(Wyo), *Bedload-transport rate.

Quantitative measurements of bedload-transport rate in the East Fork River, Wyoming, show large spatial and temporal variations in traction load. The standard deviation for 1-minute increments of the mean transport rate is commonly 50-100 percent of the mean transport rate. The transport rates measured individually over 8 equal-length increments of channel width indicate greater than 10-fold variations in transport rates from subwidth sections of minimum transport to subwidth sections of maximum transport. (See also W78-01871) (Woodard-USGS) W78-01870

BEDLOAD MEASUREMENTS, EAST FORK RIVER, WYOMING,

Geological Survey, Berkeley, CA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div. L. B. Leopold, and W. W. Emmett. In: Proceedings of the National Academy of Sciences, Vol 73, No 4, p 1000-1004, April 1976. 1 fig, 2 tab, 2 ref.

Descriptors: *Sediment transport, *Bed load, *Sedimentation rates, *Snowmelt, *Wyoming, Measurement, Analytical techniques, Drainage area, Channel morphology, Flow rates, Evaluation, *East Fork River(Wyo), *Bedload-transport rate.

A bedload trap in the riverbed provided direct quantitative measurement of debris-transport rate

Field 2—WATER CYCLE

Group 2J—Erosion and Sedimentation

in the East Fork River, Wyoming, a basin of 466-square-kilometer drainage area. Traction load moves only during the spring snowmelt season. Data collected in three spring runoff seasons during which a peak flow of 45 cubic meters per second occurred, showed that transport rate is correlated with power expenditure of the flowing water and at high flows becomes directly proportional to power as suggested by Bagnold. (See also W78-01870) (Woodard-USGS)
W78-01871

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS.
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-01907

FLOOD EFFECTS ON STREAM ECOSYSTEMS.
Soil Conservation Service, Little Rock, AR.
For primary bibliographic entry see Field 2E.
W78-01919

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS.
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W78-01935

NEARSHORE SEDIMENTS OF THE ILLINOIS SHORE OF LAKE MICHIGAN.
Illinois Univ. at Urbana-Champaign. Dept. of Geology.
J. B. Graf.
Journal of Great Lakes Research, Vol. 2, No. 2, p 283-293, December 1976. 8 fig, 15 ref.

Descriptors: *Sediments, *Shores, *Lake Michigan, *Illinois, *Great Lakes, Sediment distribution, Bottom sediments, Lake sediments, Lakes, Particle size, Sampling, Surveys, Sedimentology, Limnology.
Identifiers: *Zion(III), *Waukegan(III).

Sediment sampling and a bathymetric survey of the nearshore zone of Lake Michigan between Waukegan and Zion, Illinois, provided a detailed description of the area and a basis for comparison to models of textural variation in nearshore zones. The survey, made 15-30 June 1973, yielded evidence that the breaker zone along the shoreline extends to depths of about 6 m (20 ft), that waves significantly affect the bottom to depths of 6 to 8 m (20 to 25 ft), and that some agent, probably wave action, is able to move silt and clay-sized sediment at the greatest depths of the study (15 m or 50 ft). Although the field area is composed dominantly of fine, well-sorted sands, an area of bedforms composed of coarser, more poorly sorted sediments was found within the area. Sediments on the crests of the bedforms, now at depths of 12 to 15 m (40 to 50 ft), have characteristics in common with sediments forming the crests of longshore bars and may represent deposits of a lower-than-present lake level. (Sims-ISWS)
W78-01984

SEDIMENTATION RATES AND A SEDIMENT BUDGET FOR LAKE ONTARIO.
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, and N. S. Harper.
Journal of Great Lakes Research, Vol. 2, No. 2, p 324-340, December 1976. 4 fig, 3 tab, 47 ref.

Descriptors: *Sedimentation rates, *Lake Ontario, *Lake sediments, *Pollen, *Great Lakes, Sediments, Bottom sediments, Sediment load, Sediment transport, Sediment distribution, Lakes, Erosion, Sediment discharge, Dating, Sampling,

Surveys, Data processing, Sedimentology, Limnology.
Identifiers: Sediment sources.

Present-day sedimentation rates of fine-grained sediment were determined at 39 offshore locations in Lake Ontario. The sedimentation rates were calculated by averaging the weight of sediment deposited above the ragweed pollen horizon, dated at 1850. The rates are variable, ranging from a low of 85 g/sq m/yr (0.3 mm/yr) to a maximum of 1225 g/sq m/yr (2.2 mm/yr). Rates are highest at the eastern and western extremes of the main basin of the lake and appear to be related to littoral drift patterns. Mean sedimentation rates of 435, 260, 550, and 530 g/sq m/yr were calculated for the Niagara, Mississauga, Rochester, and Kingston Basins, respectively. A total of 4.8 million tons of fine-grained sediment is deposited annually in the lake. River inputs are the major source of the fine grained sediments with the Niagara River accounting for 50% of all incoming material. Most of the suspended materials are deposited in the Rochester and Kingston Basins (38%) or are carried out of the lake via the St. Lawrence River (36%). This reflects the general eastward movement of the materials and their deposition either towards the outlet or their movement out of the lake. (Sims-ISWS)
W78-01985

TURBIDITY SOURCES IN LAKE SUPERIOR.
Minnesota Univ.-Duluth. Dept. of Physics.
K. Stortz, R. Clapper, and M. Sydor.
Journal of Great Lakes Research, Vol. 2, No. 2, p 393-401, December 1976. 7 fig, 2 tab, 11 ref.

Descriptors: *Turbidity, *Lakes, *Lake Superior, *Wisconsin, Suspended solids, Runoff, Suspended load, Hydraulics, Profiles, Mathematical studies, Mathematics, Beach erosion, Erosion, Bottom sediments.
Identifiers: *Turbidity sources, Turbidity profiles, Turbidity plumes, Bottom sediment resuspension.

LANDSAT data and measurements of turbidity profiles with depth, suspended solids, and particle sizes were used in analysis of red clay turbidity plumes in western Lake Superior for a variety of wind conditions. The measurements allow for an estimate of the relative contribution to lake turbidity arising from shore erosion, runoff, and bottom sediment resuspension. The major source of turbidity is erosion, yielding as estimated 2,300,000 metric tons of material removed per year from the shores of Douglas County, Wisconsin. This is equivalent to a shore recession rate of nearly 1.2 m/year. During the months of May through November when all three turbidity sources contribute, 70% of the total suspended load observed in the lake is due to shore erosion, 10% is due to precipitation runoff from the rivers (with major input in this category coming from the Nemadji River), and 20% of the load is due to resuspension. (Lee-ISWS)
W78-01988

THE RATE OF SILT ACCUMULATION IN THE LOWER PEEL RIVER, NORTHWEST TERRITORIES.
Department of Indian Affairs and Northern Development, Ottawa (Ontario). Northern Natural Resources and Environmental Branch.
R. M. Strang.
Can J For Res. 3(3), p 457-458, 1973.

Descriptors: *Silt, *Rivers, *Radioactive dating, Root systems, Detritus, Sediments, Conifers, Canada, Radiocarbon dating, Peel River.

Estimates of the rates of silt accumulation in the lower Peel River (Northwest Territories, Canada) were derived from excavated root systems of white spruce (*Picea glauca* (Moench) Voss) and from radiocarbon dating of buried detritus. Average annual accumulation is of the order of 1 cm.—Copyright 1974, Biological Abstracts, Inc.

W78-02152

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND.
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A.
W78-02192

2K. Chemical Processes

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY.
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W78-01822

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER.
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. Steinberg, and V-D. Dang.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL 20535-R. Price codes: A03 in paper copy, A01 in microfiche. Presented at 'A Symposium on U.S. Lithium Resources and Requirements by the year 2000', U.S. Geological Survey, Denver, Colorado, January 22-24, 1976. September 1975. 34 p, 3 fig, 9 tab, 37 ref. BWL 20535-R.

Descriptors: *Sea water, *Separation techniques, Extraction, *Ion exchange, Nuclear reactors, *Solar distillation, *Electrolysis, Evaporation, *Lithium, Lithium chloride, Theronuclear reactor, Nuclear powerplants.

Extraction of lithium from seawater is discussed in the framework of literature data projections on the future demand for lithium, concern for lithium availability in a growing controlled thermonuclear reactor (D-T fuel cycle) economy, and estimated reserves of lithium in seawater. The process features evaporation of seawater by solar energy to increase the concentration of lithium and to decrease the concentration of other cations. After cations are separated, lithium ions are eluted with dilute hydrochloric acid to form aqueous lithium chloride. Lithium metal is then formed by electrolysis of the concentrated lithium chloride. The energy requirement for lithium extraction is relatively small when compared to the energy produced from the use of lithium in a controlled thermonuclear reactor, and the production cost of the process is estimated as 2.2 to 3.2 cents/gram lithium. It is recommended that (1) a thorough phase equilibria study of the solid-liquid crystallization processes of seawater be conducted to obtain a more definitive basis for the process design relative to the operation of solar ponds, (2) a laboratory search be undertaken for a highly selective adsorbent or extractant for lithium, and (3) trials should be made of other physical separation processes. (Wares-IPA)
W78-01849

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
For primary bibliographic entry see Field 5A.
W78-01854

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA.
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.

W78-01864

BIOLOGICAL ELECTRODES SPECIFIC FOR PHOSPHATE AND NITRITE IONS,
New Orleans Univ., LA.
For primary bibliographic entry see Field 5A.
W78-01885

NITRATE INTERFERENCE IN TOTAL KJELDAHL NITROGEN DETERMINATIONS AND ITS REMOVAL BY ANION EXCHANGE RESINS,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-01886

THE ECOLOGY OF A HIGH MOUNTAIN STREAM IN THE PYRENEES: II. CHEMICAL CONDITIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
P. Lavandier, and C. Mur.
Ann Limnol. 10(3), p 275-310, 1974.

Descriptors: *Water chemistry, Rivers, Conductivity, *Ecology, *France(River Estaragne), *High mountain streams, Plant growth, Streams, Snow-melt.

The chemical features of the River Estaragne (France) and its tributaries were studied in relation to general geographical conditions. Bicarbonates and C formed more than 90% of the ionic content of the water. The amounts of total Fe, Ca++, HCO3-, SO4--, PO4-P, NO3-N, Mg++ and K+ decreased from the source of the river to its mouth. Concentrations of Na+, Cl- and SiO2 remained constant or increased slightly down the length of the river. Conductivity changes from 114-80 micro mhos between the source and the mouth of the river. The changes in the chemical composition of the water are related to changes in the stream bottom from unstable, naked bedrock to crystalline bedrock covered with plants. Most of the chemical features showed some significant correlation with flow. The quantities of material transported down the stream during the 2 yr of the study were estimated. The river discharged into Lake Oredon a mean of 470 tons/yr of dissolved elements; 65% of this material is carried down the river when the snow melts.—Copyright 1975, Biological Abstracts, Inc.
W78-01957

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: II. ADDITIONAL FEATURES OF THE CHEMISTRY OF MACQUARIE ISLAND LAKES AND TARNs,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. T. Buckney, and P. A. Tyler.
Aust J Mar Freshwater Res. 25(1), p 89-95, 1974.

Descriptors: Calcium, Islands, Lakes, *Limnology, *Macquarie Island lakes, Magnesium, Ocean spray, *Reconnaissance, Seasonal, Spray, Subantarctic, *Tarns, *Water chemistry, *Ions.

Further analyses of waters from lakes and tarns on Macquarie Island, including some not previously sampled, confirm conclusions of an earlier survey. Oceanic spray is a principal source of ions. Geochemical influence is minimal in most lakes, but Square Lake and Waterfall Lake contain considerably more Ca than others and the cationic dominance order is changed from that of seawater. Skua Lake is similarly affected though Ca concentrations are not so markedly increased. Mg enrichment does not occur. Though Ca and bicarbonate accrue in approximately equivalent amounts, more lakes are deflected from seawater anionic dominance order than the 3 with changed cationic orders. Despite equivalent accession of

Ca and bicarbonate, Square Lake and Waterfall Lake occupy anomalous positions on a plot of Ca proportions against Oceanic Origin Factor. Seasonal variation in chemical composition is slight, but is greatest in Waterfall Lake and least in shallow Square Lake where perhaps buffering by sediments is involved. Atmospheric supply of oceanic ions is commonplace on Sub-Antarctic islands.—Copyright 1974, Biological Abstracts, Inc.
W78-02004

2L. Estuaries

OFFSHORE ISLANDS,
Harris (Frederick R.), Inc., New York.
For primary bibliographic entry see Field 8B.
W78-01704

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE,
Sylvester Undersea Inspection, Rockland, MA.
For primary bibliographic entry see Field 5C.
W78-01714

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT),
Spessard L. Holland Law Center, Gainesville, FL.
For primary bibliographic entry see Field 6E.
W78-01730

PUBLIC USE OF COASTAL BEACHES,
North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6E.
W78-01731

THE PROBLEM OF THE NUTRITION OF THE GOBY BENTHOPHILUS STELLATUS (GOBIIDAE) IN THE DNIESTER ESTUARY, (IN RUSSIAN),
Azovo-Chernomorskii Nauchno-Issledovatel'skii Inst. of Morskogo Rybnogo Khozyaistva i Okeanografii, Odessa (USSR). Odessa Div.
I. F. Strautmai.
Vestn Zool 3, p 45-48, 1976.

Descriptors: Nutrients, *Fish food organisms, Seasonal, *Estuaries, *Benthophilus-stellatus, Gobiidae, Goby, *Nutrition, Ukrainian-SSR, *USSR(Dniester estuary).

Qualitative and quantitative food composition was analyzed in 215 individuals of *B. stellatus* (Savvage) from the Dniester estuary (Ukrainian SSR, USSR). Changes in food spectra are determined depending on season, sex and body dimensions. Food relations of *B. stellatus* and other species of gobies from the Dniester estuary are traced.—Copyright 1977, biological Abstracts, Inc.
W78-01735

RESOURCE MANAGEMENT AND ESTUARINE FUNCTION WITH APPLICATION TO THE APALACHICOLA DRAINAGE SYSTEM,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 5G.
W78-01764

THE RHODE RIVER PROGRAM,
Smithsonian Institution, Edgewater, MD.
For primary bibliographic entry see Field 5G.
W78-01765

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.
W78-01766

PROBLEMS, ADVANCEMENTS, AND FACTORS CONTROLLING ESTUARINE WILDLIFE MANAGEMENT PROGRAMS,
Texas A and M Univ., Jasper.
H. D. Irby.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 43-55.

Descriptors: *Estuaries, *Wildlife management, *Ecosystems, *Baseline studies, Water pollution effects, Marshes, Resources development, Environmental effects.

Marshes and estuaries along our coastlines are among the most fertile and valuable land and water areas in North America. These areas provide habitats for some of our most valuable wildlife and fisheries resources, supplying livelihood, recreation, and aesthetic enjoyment for a multitude of people. Wildlife usage of high quality estuarine areas is extensive. Wildlife management is an attempt to rectify past habitat abuses and then, hopefully, to bring about a positive enhancement of the desired wildlife and their habitats. The wide variety of human activities which pollute estuarine wildlife resources is discussed along with recent progress in estuarine wildlife management programs. Finally, future trends and needs in estuarine wildlife management are discussed. (Sinha-OEIS)
W78-01767

IMPACT OF ESTUARINE POLLUTION ON BIRDS,
Fish and Wildlife Service, Laurel, MD.
For primary bibliographic entry see Field 5C.
W78-01768

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-01769

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5G.
W78-01770

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,
Development and Resources Corp., Sacramento, CA.
For primary bibliographic entry see Field 6G.
W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,
East Carolina Univ., Greenville, NC.
For primary bibliographic entry see Field 5G.
W78-01772

STATUS OF ESTUARINE ECOSYSTEMS IN RELATION TO SPORTFISH RESOURCES,
Conservation Foundation, Washington, DC.

Field 2—WATER CYCLE

Group 2L—Estuaries

For primary bibliographic entry see Field 6G.
W78-01773

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,
Living Marine Resources, Inc., San Diego, CA.
G. C. Broadhead.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 171-176, 3 fig, 20 ref.

Descriptors: *Estuaries, *Estuarine fisheries, *Environmental effects, *Commercial fishing, Shrimp, Resources development, Water pollution effects, Baseline studies, Menhaden.

The estuarine habitat of fish and shellfish is eroded by both natural and man-caused environmental changes. Shrimp and menhaden are discussed principally, noting the effects on them of salinity, temperature, and turbidity. The soft-bottomed embayments peripheral to the estuaries offer preferred living conditions. They are more productive—and more vulnerable—than the open waters of the estuaries. Recommendations are made for preserving these estuarine habitats. (Sinha-OEIS)
W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01776

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5G.
W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE,
Miami Univ., FL.
For primary bibliographic entry see Field 5G.
W78-01779

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING,
Espey, Huston and Associates, Inc., Austin, TX.
For primary bibliographic entry see Field 5G.
W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES,
American Univ., Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5G.
W78-01782

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-01783

POLLUTION PROBLEMS IN THE ESTUARIES OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 5G.
W78-01784

ENVIRONMENTAL STATUS OF HAWAIIAN ESTUARIES,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5G.
W78-01785

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W78-01786

INDUSTRIAL WASTE POLLUTION AND GULF COAST ESTUARIES,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01787

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS,
Maryland Univ., Solomons.
For primary bibliographic entry see Field 5G.
W78-01789

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS,
Ecological Analysts, Inc., Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-01790

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 5G.
W78-01791

OIL POLLUTION IN THE COASTAL ENVIRONMENT,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W78-01793

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION,
Environmental Impact Planning Corp., San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-01794

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Johns Island, SC.
Bears Bluff Field Station.
For primary bibliographic entry see Field 5G.
W78-01795

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, FL.; and Eco-Analysts, Inc., Sarasota, FL.
For primary bibliographic entry see Field 5C.
W78-01796

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-01798

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,
American Petroleum Inst., Washington, DC.
For primary bibliographic entry see Field 5B.
W78-01799

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-01800

THE CRUCIAL ROLE OF SYSTEMATICS IN ASSESSING POLLUTION EFFECTS ON THE BIOLOGICAL UTILIZATION OF ESTUARIES,
Delaware Univ., Lewes.
For primary bibliographic entry see Field 5C.
W78-01801

BACTERIA AND VIRUSES—INDICATORS OF UNNATURAL ENVIRONMENTAL CHANGE OCCURRING IN THE NATION'S ESTUARIES,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-01802

NATIONAL ESTUARINE MONITORING PROGRAM,
Environmental Protection Agency, Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-01803

A BRIEF ASSESSMENT OF ESTUARY MODELING—RECENT DEVELOPMENTS AND FUTURE TRENDS,
Corvallis Environmental Research Lab., OR.
R. J. Callaway.
In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 523-525, 5 ref.

Descriptors: *Estuarine environment, *Model studies, Baseline studies, Water pollution effects.

A brief, very informal, overview of estuarine modeling is presented; the great variety in estuarine environmental settings is exhibited with east and west coast examples. Typical problems

confronted by the environment scientist and engineer are discussed as well as some of the solution techniques employed to solve them. (Sinha-OEIS)
W78-01804

FACTORS BEARING ON POLLUTION CONTROL IN U.S. PORTS LOCATED IN ESTUARINE AREAS.
Portland Harbor Pollution Abatement Committee, ME.
For primary bibliographic entry see Field 5G.
W78-01805

FACTORS BEARING ON POLLUTION CONTROL IN WEST COAST ESTUARINE PORTS.
San Francisco Dredging Committee, CA.
For primary bibliographic entry see Field 5G.
W78-01806

SEA GRANT ESTUARINE STUDIES.
Texas A and M Univ., College Station.
L. F. Miloy.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 555-565, 4 tab, 60 ref.

Descriptors: *Estuarine environment, *Ecosystems, *Water pollution, Research priorities, Oceanography, Bibliographies, *Outer Continental Shelf.

Approximately 20% of funds dispensed under the National Sea Grant College and Program Act of 1966 (PL 89-688) has been directly related to estuarine studies. Since 1971 \$13 million in federal funds, matched by \$8 million in non-federal support, has been directed to this area. In the same period 533 projects in support of ecosystems research, coastal zone management, pollution studies, environmental modeling, and applied oceanography were conducted under the Sea Grant Program. Brief case histories of estuarine related studies in Narragansett Bay, Long Island Sound, the Neuse and Albemarle River Basins, Apalachicola and Escambia Bays, Barataria Bay, Matagorda Bay, and Puget Sound are presented as examples of Sea Grant work. The applied nature of Sea Grant studies is emphasized by examples of the utilization of Sea Grant estuarine-related research. Particular attention is given to how these studies have been used by local, state, and federal decisionmaking bodies. A partial bibliography citing 58 Sea Grant reports on estuarine research is presented. (Sinha-OEIS)
W78-01807

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION.
University of West Florida, Pensacola.
T. S. Hopkins.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 567-579, 2 fig, 2 illust, 59 ref.

Descriptors: *Estuarine environment, *Florida, *Water quality control, *Regional development, *Ecosystems, Resources development, *Outer Continental Shelf, *Estuarine protection, Regional planning, Public interest.

Florida's gulf coastline measures over 700 statute miles, and has the most diverse estuarine flora and fauna of any state. Because of its growing population and its readily accessible coastline probably no other estuarine system has received pressures comparable to those exerted on Florida's gulf coast ecosystem from 1950 to the present. This paper revolves around the 'Florida Panhandle' in general and Pensacola in particular. Citizen involvement begins through information services provided by newspaper, radio, and TV. In Pensacola, the newspaper media had the greatest impact and long-term effect. There are a variety of vehicles and mechanisms for citizen involvement and many were sportsmen's organizations. Homeowner's associations also can be effective vehicles, but they may be self serving and are more subject to varying levels of bureaucracy. Regional planning organizations are a proper vehicle but they are even more dependent upon and subject to government bureaucracy. Governmental advisory groups can be effective if they can maintain good relations with the board that appoints them and if they can understand that governments cannot correct overnight the damages done by poor planning through decades. Regional, state, and federal hearings are an excellent outlet for citizen pressures. It is concluded that the Regional Planning Council should be the lead agency in coordinating citizen efforts in estuarine preservation. (Sinha-OEIS)
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARINE PROTECTION.
Public Relations Consultant, Corpus Christi, TX.
For primary bibliographic entry see Field 5G.
W78-01809

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA.
Horan, Lloyd, Dennis, and Farr, Carmel, CA.
F. S. Farr.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 4 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 593-603.

Descriptors: *Estuarine environment, *Wetlands, *California, Resources development, Coasts, *Public participation, Citizens action groups.

The shocking destruction by man of California's wetland and coastal resources has occurred for more than a century, by competing uses for industrial, commercial, residential and recreational purposes. More than 80% of California's 21 million people live within one-half hour's drive of the coast. Pressures on resources in coastal areas is unbearable. This paper tells what citizen action groups have done in attempting to reverse these trends. (Sinha-OEIS)
W78-01810

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE.
Washington Univ., Seattle.
For primary bibliographic entry see Field 5G.
W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES.
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 5G.
W78-01812

ESTUARINE MANAGEMENT—THE INTER-GOVERNMENTAL DIMENSION.
For primary bibliographic entry see Field 6E.

W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES.
Georgia Univ., Athens.
For primary bibliographic entry see Field 5G.
W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES.
Maryland Univ., College Park.
For primary bibliographic entry see Field 5G.
W78-01815

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES.
Environmental Protection Agency, Washington, DC.
D. P. Tihansky, and N. F. Meade.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 671-684, 2 tab, 59 ref.

Descriptors: *Estuarine fisheries, *Economics, *Resources development, *Estuarine environment, Baseline studies, Water quality control, Water pollution control, *Outer Continental Shelf, Commercial fisheries.

The economic importance of estuaries is assessed in their supportive role of the U.S. commercial fishing industry. Economic welfare concepts are related to major phases of the fishing industry, and empirical estimates of these values are surveyed in the literature. The exvessel price of landed species is cited to be a conservative estimate of net benefits realized by all phases. The literature survey reveals that most economic studies of fishery benefits are conducted without any apparent knowledge of valid welfare concepts. This gap between empirical and theoretical constructs must be eliminated if economic values are to be plausible and meaningful. (Sinha-OEIS)
W78-01816

ORGANIZATION ARRANGEMENTS FOR MANAGEMENT OF ATLANTIC COAST ESTUARINE ENVIRONMENTS.
Virginia Inst. of Marine Science, Gloucester Point.
M. P. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No 440/1-77-007B, Mar 1977. Vol 2, p 687-700, 2 fig, 9 tab, 15 ref.

Descriptors: *Estuarine environment, *Management, *Legal aspects, Resources development, Coasts, U.S. East Coast, *Outer Continental Shelf, *Coastal Zone Management Act, State programs.

Since 1969, the general trend in management of Atlantic coast estuarine environments has been to strengthen state and regional capabilities principally through new federal funding programs. Interstate management entities, with limited exceptions, are not playing an extensive or significant role. Many approaches are used for estuarine management by the various states. Critical management decisions typically involve specific site-related permit decisions. In many states, these individual decisions are made within a framework

Field 2—WATER CYCLE

Group 2L—Estuaries

of overall state guidelines, policy, or legislative mandate. All states have adopted strict Coastal Zone Management programs. No states have separate estuarine management agencies, relying instead, on several related agencies or centralized environmental "super agencies." Coordination is the most necessary element of effective estuarine management. The Coastal Zone Management Act has provided states with the initiative (and funds) to effect a better coordination within their own agencies and with other states on a regional basis. Estuarine management has improved in the period 1969-1974 as a direct result of increased federal funding supported by a growing awareness of the importance of a quality environment among the general population. The principal factor in estuarine management in the next five to ten years will probably be local acceptance and support of developing Coastal Zone Management programs. (Sinha-OEIS)
W78-01817

EVALUATION OF WATER QUALITY IN ESTUARIES AND COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5G.
W78-01818

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION,
University of the Pacific, Dillon Beach, CA.
Pacific Marine Station.
For primary bibliographic entry see Field 5G.
W78-01819

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
For primary bibliographic entry see Field 5C.
W78-01820

SETTLEMENT OF VENICE AND GENERAL ESTUARINE DEPOSITS,
Cape Town Univ. (South Africa).
A. D. Sparks.
9th International Conference (ICSMEF) Tokyo, July 1977. 6 p., 7 fig., 18 ref.

Descriptors: Groundwater, *Subsidence, *Estuarine sediments, Aquifers, Artesian wells, Aquifers, Soil stability, Mathematical models, Subsurface mapping, *Venice (Italy), South Africa.

Artesian conditions, such as at Venice, can exist in other offshore or estuarine deposits. The previous existence of artesian groundwater pressures increases the settlements due to pumping. Attention is drawn to the fact that soil layers located below the deepest major well can suffer delayed compression due to pumping from the wells. Mathematical computer models based on finite differences are derived for steady-state and dynamic conditions for a general aquifer-aquitard system in which the permeabilities and thicknesses of the layers vary laterally from one position to another. The future settlement at Venice is estimated. A physical model constructed at UCT is mentioned. A solution is proposed. (So African Water Info Center)
W78-01829

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,
Cape Town Univ. (South Africa).
A. Du Plessis, and M. A. Delacruz.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p. 285-302, May 1977. 9 fig., 18 ref.

Descriptors: *Geophysical investigations, Sediments, Sea floor, *Marine geology, Core drilling, *Boreholes, *Seismic reflection, Seismograph, Sonar, Bays, *South Africa, *Saldanha Bay.

Detailed continuous seismic reflection profiling and side-scan sonar surveys were made of the part of Saldanha Bay that lies to the landward of a line connecting Hoedjiespunt and Salamanderpunt (the "inner" bay). Six distinctive subsurface units (Q-units) were recognized in the seismic records. They were correlated with a sequence of lithologically distinctive units encountered in boreholes drilled in the bay. At any instant in time the sea abrades the sea floor above a certain limiting depth and deposits materials below that depth. The incursion of the sea into an area therefore leads both to the removal and deposition of materials. The borehole results and the three-dimensional distribution of the Q-units in the bay indicate that the area has been affected by three abrasional/deposition cycles during the Late Pleistocene. During the earliest transgression the sea rose to a few metres above sealevel. During the second transgression it rose to -20m. The last transgression took place when the sea rose to its present stand. While the sea stood at lowered levels, calcareous formed subaerially along "preferred" zones in the marine deposits that were present. The main period of calcareous formation in the area was between the earliest and next transgression. (So. African Water Info Center)
W78-01834

LARVAL DEVELOPMENT, SETTLEMENT AND GROWTH OF THE BLACK MUSSEL CHLOROMYXUS MERIDIONALIS IN THE SALDANHA BAY REGION,
Fisheries Development Corp. Ltd., Salanah (South Africa).
A. J. Du Plessis.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p. 303-316, May 1977. 8 fig., 19 ref.

Descriptors: *Black mussel, Marine animals, Benthic fauna, Population dynamics, Reproduction, Growth stages, Larval growth stage, Settlement, Bays, Mariculture, Shellfish, Plankton, Filter feeders, Intertidal areas, Life cycles, Water temperature, Seasonal variations, *Mussels, Chloromyxus meridionalis, *Saldanha Bay, Langebaan Lagoon, Luderitz Bay, *South Africa.

Aspects of the biology of *Chloromyxus meridionalis* were studied while investigating possibilities for cultivating mussels. Plankton samples were taken regularly, and growth, development and settlement behaviour of the larvae are discussed and correlated with results of a larval rearing experiment. Methods are described for the recording of settlement, and the results indicate annual, seasonal and local fluctuations in intensity of settlement at a number of sites. Reference is made to results obtained in Luderitz Bay. The growth rate of mussels suspended from rafts was determined and indicates considerable variation within the study area. This is discussed and aspects of the annual growth curves are presented. Water temperatures were obtained in Saldanha Bay during 2.75 years by means of a continuous recorder. (So. African Water Info Center)
W78-01835

DISTRIBUTION OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geology.
B. W. Flemming.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p. 317-340, May 1977. 21 fig., 32 ref.

Descriptors: *Sediments, *Distribution pattern, Textural analysis, Sediment analysis, Sands, Sedimentology, Bottom sediments, Marine sediments, *Sediment transport, Tidal effects, *Saldanha Bay, Langebaan Lagoon, *South Africa.

Sediment distribution in Saldanha Bay is wave controlled and can be related to the energy levels

created by the refraction pattern. Four energy zones are distinguished in the inner bay: a centrally exposed zone, two marginal semi-exposed zones, a sheltered zone in the north and a bay/lagoon transitional zone in the south. Sediment is supplied on the abrasion platform of the exposed zone and along the rocky shoreline of the North Channel. These areas display the coarsest sediments. In North Bay medium sands dominate, whereas the South Channel is characterized by very fine sands. Both semi-exposed zones as well as the sheltered zone consist of very fine sand. The bay/lagoon transitional zone is constructed of a tidal delta made of fine sand. Sediment distribution seems to be in equilibrium with the prevailing hydrodynamic regime. In contrast, Langebaan Lagoon is a current controlled regime. Four physiographic units can be separated: tidal channels, subtidal flats and sandbanks, intertidal flats, and salt marshes. These units reflect the major energy levels of the tidal system. Texturally the lagoon divides into two major zones separated roughly by the central channel. East of the channel fine sands dominate whereas west of the channel medium sands are more frequent. Coarse sediments occur as lag deposits in the northern outflow channels. In contrast to the dominating presence of very fine sand in Saldanha Bay this fraction is surprisingly deficient in Langebaan Lagoon. There is evidence for a Holocene High stand of the sea between 6,000 and 2,000 y.B.P. The modern sediment distribution is the results of the subsequent regression and stabilization of the sea-level about 1,800 y.B.P. and is therefore essentially a relict feature. (So. African Water Info Center)
W78-01836

PHYTOPLANKTON PRODUCTION IN LANGEBAAN LAGOON AND SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
J. L. Henry, S. A. Mostert, and N. D. Christie.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p. 383-398, May 1977. 7 fig., 5 tab., 16 ref.

Descriptors: *Phytoplankton, *Primary productivity, Seasonal variations, Turbidity, Light intensity, Surveys, Baseline studies, Chlorophyll, South Africa, Water temperature, Salinity range, Marine biology, Bays, Lagoons, *South Africa, *Langebaan Lagoon, *Saldanha Bay.

Between February 1971 and February 1972 monthly measurements of phytoplankton primary production were made at six stations in Langebaan Lagoon. The gross primary production rates obtained showed a marked seasonal variation. They increased from 261.6 mgC/3m³/day in winter to 675.4 mgC/3m³/day in spring and to a maximum of 885.3 mgC/3m³/day in summer. Production rates ranged from 611.0 mgC/3m³/day at the entrance of the lagoon to 162.6 mgC/3m³/day at the station nearest to the head of the lagoon. A correlation between total chlorophyll and gross primary production was established for the lagoon, and was used in conjunction with chlorophyll concentrations and water transparency measurements from Saldanha Bay to estimate the gross primary production of the bay. The estimates ranged from 864.9 mgC/m²/day to 3 301.2 mgC/m²/day. (So African Water Info Center)
W78-01837

SPATIAL AND TEMPORAL VARIATIONS IN INTERTIDAL ANIMAL DISTRIBUTION AT LANGEBAAN LAGOON, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitzpatrick Inst. of African Ornithology.
G. M. Puttick.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p. 403-440, May 1977. 11 tab., 17 fig., 35 ref.

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Descriptors: *Temporal variations, *Spatial distribution, *Intertidal areas, Species distribution, Benthic fauna, Marine animals, Filter feeders, Food chains, Water birds, Biomass, Seasonal effects, Marine algae, Sediments, *Lagoons, *Langebaan Lagoon, *Calidris ferruginea*, Gastropoda, *South Africa.

Spatial and temporal changes in the distribution of food organisms potentially available to curlew sandpipers *Calidris ferruginea* at Langebaan Lagoon (33 degrees S, 18 degrees E) are described for the period February 1974 - March 1975. The inter-tidal benthic fauna at sandy sites showed spring and autumn peaks in biomass and numbers. The fauna was dominated by the gastropod *Assiminea globulus*, which comprised 62.5% of the total biomass. A Production: Biomass ratio of 4.96 was found for this species, and 1.36 for the amphipod *Urothoe grimaldi*. The fauna at sites containing macrophytes (*Spartina*, *Zostera*, *Arthrocnemum*) showed winter peaks in biomass and numbers. Classification and ordination confirmed the discreteness of macrophyte and non-macrophyte sites each having its own characteristic benthos. There was a positive correlation between the distribution of benthos and sediment parameters at the different sites, macrophyte sites having a higher fine fraction and organic content. (So African Water Info Center) W78-01838

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER IN SALDANHA BAY AND LANGEBAAN LAGOON. Department of Industries, Sea Point (South Africa). Sea Fisheries Branch. L. V. Shannon, and G. H. Stander. Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 441-459, May 1977. 1 tab, 10 fig, 32 ref.

Descriptors: *Sea water analysis, Baseline studies, Thermohaline convection, Water temperature, Salinity range, *Chemical analysis, Trace elements, Heavy metals, Chlorophyll, Phosphorus, Nitrates, Nitrites, Silica, Marine pollution, Fish processing wastes, Water circulation, Tidal currents, Toxic wastes, Chemical oxygen demand, *Saldanha Bay, *Langebaan Lagoon, *South Africa.

In April 1974 the Sea Fisheries Branch commenced a detailed survey of the physical and chemical characteristics of the water in Saldanha Bay and Langebaan Lagoon to establish base-line conditions in the region prior to the development of the bay as a major port and industrial centre. The thermohaline characteristics of the water resemble those of the Benguela Current, although in summer surface heating and evaporation tend to raise the temperature and salinity somewhat. This is most marked in the Langebaan Lagoon where surface temperatures and salinities in excess of 24 degrees Centigrade and 37‰ were recorded during the latter part of summer. A variety of chemical parameters were determined. These include a number of heavy and transition elements, dissolved oxygen, nitrate/nitrite, inorganic phosphorus, total phosphorus, reactive silica, pH, chlorophylls, chemical oxygen demand and oxygen absorbed. Data for some of these parameters are tabulated, and indicate that the bay is at present relatively unpolluted. Prior to 1974 organic pollution from the fish factories in Hoedjies Bay was serious, but the situation has shown a marked improvement since the installation of the dry off-loading systems for fish. The circulation pattern in Saldanha Bay is complex. The bay and lagoon are tidal and currents in the upper 5 m are highly dependent on wind speed and direction. Surface currents in the region have a magnitude typically in the range 10-20 cm/sec. Currents in the mouth of the bay are tidal and are not appreciably influenced by wind. Tidal currents of up to 1 m/sec were recorded at the entrance of Langebaan Lagoon. The construction of the jetty and break-

water is altering the circulation pattern. The physical and chemical data indicate the existence of three systems, viz. Bay system, Lagoon System and Benguela System. The interchange between the bay and the open sea is small and on the basis of a simple model the removal time of pollutants from the bay was calculated as 20 days. The available data indicate that the discharge of noxious and toxic effluents into the bay should be discouraged. The beach near the residential area of Saldanha Bay and the Donkergat peninsula will probably be polluted on occasions once the harbour comes into operation, and it is not impossible that Langebaan Lagoon will also become polluted. (So African Water Info Center) W78-01839

THE ALGAL FLORA OF SALDANHA BAY.

Department of Industries, Sea Point (South Africa). Sea Fisheries Branch. R. H. Simons. Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 461-482, May 1977. 2 tab, 5 fig, 31 ref.

Descriptors: *Marine algae, Sampling stations, Baseline studies, Primary productivity, Algae distribution, Algae population, Chlorophyta, Phaeophyta, Rhodophyta, *Saldanha Bay, Ecklonia, *South Africa.

A critical review of old records of Algae of Saldanha Bay accompanies accounts of more recent surveys within this bay. The range of habitats includes rocky and sandy substrata, shores comparable with those of open coasts in terms of surf stress and those in which water movement is so reduced as to be little more than tidal ebb and flow. The conclusion is reached that the algal flora is basically of the South African west coast; modifications are imposed by protection from wave stress. (So African Water Info Center) W78-01840

DISTRIBUTION ABUNDANCE AND ENERGY RELATIONSHIPS OF WADERS (AVES: CHARADRII) AT LANGEBAAN LAGOON. Cape Town Univ. (South Africa). Percy Fitzpatrick Inst. of African Ornithology. R. W. Summers. Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 483-494, May 1977. 5 tab, 3 fig, 22 ref.

Descriptors: Species abundance, Food chains, Biomass, Waders, *Langebaan Lagoon, *Salt marshes, Population studies, Species distribution, Marine ecosystems, Intertidal areas, Seasonal variations, Water birds, *Charadrii, *Arthrocnemum, *South Africa.

The distribution and numbers of waders on the low-tide sandflats and at high-tide roosts at Langebaan Lagoon during the austral summer of 1975-76 are described. The sandflats in Rietbaai and at the lower and upper sections of the lagoon supported the highest densities of waders. Several species were restricted in their distribution. The majority of the high-tide roosts, incorporating some 30,000 waders, were situated on *Arthrocnemum* saltmarsh, especially between Botterlay and Geelbek. Approximately 1,000 waders (3% of the lagoon's population) roosted on the beaches along the Atlantic coastline at high-tide. Many thousands roosted on the beach north of Langebaan village at night. The wader community consumed an estimating quantity of food equivalent to 20.8 kcal/sq m per year. Between 2.1 and 6.2 kcal/sq m per year are returned as faeces to the lagoon system. Feather material deposited in the lagoon was equivalent to 0.06 kcal/sq m per year. (So African Water Info Center) W78-01841

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON. Cape Town Univ. (South Africa). Dept. of Geochemistry.

J. P. Willis, H. H. Fortuin, and G. A. Eagle. Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 497-509, May 1977. 5 tab, 6 fig, 4 ref.

Descriptors: *Geochemistry, *Sediments, Monitoring, Sampling, Chemical analysis, Trace elements, Heavy metals, Marine pollution, Baseline studies, *Sediment analysis, Sediment transport, *Pollutant identification, *Saldanha Bay, *Langebaan Lagoon, *South Africa.

Average major and trace element data are reported for recent sediments from Saldanha Bay and Langebaan Lagoon. Chemically, the sediments are composed mainly of SiO₂ and CaCO₃ (SiO₂ + CaCO₃ greater than 93%). The sediments are considered to be a three-component mix of quartz, calcite and a granitic fraction presumed to be derived from local granitic rocks. (So African Water Info Center) W78-01842

THE ZOOPLANKTON OF LANGEBAAN LAGOON AND SALDANHA BAY. Cape Town Univ. (South Africa). School of Environmental Studies.

J. R. Grindley. Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 341-390, May 1977. 14 fig, 4 tab, 21 ref.

Descriptors: *Zooplankton, Sampling, Biomass, Salinity range, Tidal effects, Species abundance, Species diversity, Marine animals, Baseline studies, Ecology, Environment aspects, *Langebaan Lagoon, *Saldanha Bay, *South Africa.

The zooplankton of Langebaan Lagoon and Saldanha Bay are described on the basis of 127 plankton samples taken between 1946 and 1976. Hydrological conditions are described indicating a range from marine conditions in Saldanha Bay to hypersaline conditions at the head of the Langebaan Lagoon. Different zooplankton communities occur in different parts of the Saldanha-Langebaan system. In Saldanha Bay the plankton is composed predominantly of species which occur in the neritic plankton of the west coast. The plankton of Langebaan Lagoon is distinct but elements of the Saldanha Bay plankton community penetrate the lagoon to various extents. At the head of the lagoon the plankton community is estuarine in character which is remarkable as Langebaan Lagoon is not an estuary. The significance of this is discussed. Zooplankton biomass was highest in the middle reaches of Langebaan Lagoon ($X = 41.80$ mg/cu m) and lowest at the head of the lagoon ($X = 16.84$ mg/cu m) where the lowest diversity index also was recorded. Studies of diurnal variations indicate that the distribution of plankton in Langebaan Lagoon is essentially dynamic resulting from a complex interaction between vertical migration and tidal transport. (So African Water Info Center) W78-01845

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING. Lamont-Doherty Geological Observatory, Palisades, NY.

For primary bibliographic entry see Field 6G. W78-01908

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY. Texas A and M Univ., Galveston. Dept. of Marine Sciences. For primary bibliographic entry see Field 5A. W78-01911

Field 2—WATER CYCLE

Group 2L—Estuaries

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01915

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT.
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01916

BARIUM BUILD-UP IN THE TEIGN ESTUARY,
Southampton Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 5A.
W78-01933

THE EARLY SUMMER BLOOM OF DINOFLAGELLATES IN THE NORTH SEA SPECIAL REFERENCE TO 1971.
Birbeck Coll., London (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01934

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES.
New Jersey Agricultural Experiment Station, New Brunswick.
For primary bibliographic entry see Field 5B.
W78-01938

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS.
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5C.
W78-01944

STUDIES ON THE OYSTER COMMUNITY IN DELAWARE: THE EFFECTS OF THE ESTUARINE ENVIRONMENT ON THE ASSOCIATED FAUNA.
Delaware Univ., Lewes. Marine Studies Complex.
D. Maurer, and L. Watling.
Int Rev Gesamten Hydrobiol. 58(2), p 161-201, 1973.

Descriptors: Barnacles, Bivalves, Bryozoan, Crustaceans, *Delaware, Environment, *Estuarine environment, Gastropod, Hydrozoan, Malacostracan, Oligochaete, *Oysters, Polychaetes, Sand dollars, *Salinity.

The composition of the associated fauna of Delaware's oyster beds was studied. The relative position of Delaware's oyster producing tributaries lends itself to testing the classic hypothesis concerning the effect of salinity on faunal distribution. Interaction of substrate was also studied. The local oyster beds are termed the bay beds which include planted and natural populations, and the river beds. From 1967-1971, approximately 800 samples were collected. The majority of these were from the bay beds. In 1968 and 1969, 132 samples were systematically collected from the river beds and 19 from the bay beds. These were returned to the laboratory for special care in identification. Samples from fouling panels and oyster rafts provided additional species; 152 spp. were identified but only 133 spp. were statistically analyzed because they were from the systematic collections. Nonparametric statistics were used. The top 23 spp. were selected for special treatment. In order of decreasing frequency of occurrence the species were: Sabellaria vulgaris,

Conopeum tenuissimum, Panopeus herbsti, Nereis succinea, Palaemonetes vulgaris, Crassostrea virginica, Nassarius obsoletus, Polydora websteri, Membranipora tenuis, Garveia franciscana, Balanus improvisus, Diadumene leucolea, Aip-tasiomorpha luciae, Melita nitida, Obelia longicyatha, Alcyonidium polyomm, Sertularia argentea, Crangon septemspinosa, Hydroides dianthus, Eurypanopeus depressus, Modiolus demissus, Parapleustes sp., and Hartlaubella gelatinosa. Species diversity decreases up the estuary with decreasing salinity. Substrate can alter this pattern in particular cases. Within a given salinity range, the presence of any firm substrate or mud influenced the nature of the community from epifaunal to infaunal. Four faunal units were recognized: the planted and natural beds, the 4 southern rivers, the Leipsic River, the Woodland Beach area. The Leipsic River area marks a critical transition zone with a rapid reduction in species. North of Woodland Beach brackish water conditions begin to prevail. The fauna was more diverse in late spring than in the fall but seasonality was not as marked as expected. The faunal composition of Delaware's oyster beds agrees with the cosmopolitan view of estuaries. The stability-time hypothesis proposed by Sanders provides a theoretical basis to explain faunal distributions in Delaware's oyster community. This oyster community may be a sensitive indicator of environmental degradation in the estuary.—Copyright 1974, Biological Abstracts, Inc.
W78-01945

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY.
Old Dominion Univ. Research Foundation, Norfolk, VA.
For primary bibliographic entry see Field 5A.
W78-01946

SOME PRELIMINARY OBSERVATIONS ON THE ENHANCEMENT OF PHYTOPLANKTON GROWTH BY LOW LEVELS OF MINERAL HYDROCARBONS.
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-01951

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY.
Massachusetts Univ., Boston. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01952

EDAPHIC DIATOM COMMUNITIES ASSOCIATED WITH SPARTINA ALTERNIFLORA AND S. PATENS IN NEW JERSEY.
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-01956

NITROGEN FIXATION BY BLUE-GREEN ALGAL COMMUNITIES IN THE INTERTIDAL ZONE OF THE LAGOON OF ALDABRA ATOLL.
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01961

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS.
Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health.
For primary bibliographic entry see Field 5A.
W78-01962

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE-REPRISE.
San Diego State Univ., CA.
For primary bibliographic entry see Field 5B.
W78-01970

OCEAN WAVE STATISTICS FOR 1961 NORTH ATLANTIC STORM.
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
S. K. Chakrabarti, and R. P. Cooley.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13320, p 433-448, November 1977. 14 fig, 13 ref, 2 append.

Descriptors: *Ocean waves, *Statistics, *Storms, *Atlantic Ocean, Analytical techniques, Data processing, Waves(Water), Winds, Oceans, Equations, Mathematical models, Model studies, Statistical methods, Correlation analysis, Probability, Oceanography.
Identifiers: Wave height, Wave period, Wave spectra.

Various statistical quantities for a random wave system were derived by different proposed means and compared to each other. A series of ocean waves recorded during a severe storm in the North Atlantic in September 1961 was utilized for this purpose. The data included the growth and decay periods of the storm. Such quantities as the significant and maximum wave heights, wave periods, and spectral width parameter were obtained. The analysis was carried out both in the time and the frequency domain. The two methods were found to show reasonably good agreement in their results. The distributions of the individual wave heights and periods in a record and their joint distribution were investigated. The histograms for these parameters compared favorably with simple theoretical models for narrowband spectra. (Sims-ISWS)
W78-01976

A NOTE ON WINTER TEMPERATURE VARIATIONS IN A SHALLOW SEAGRASS FLAT.
Texas Univ. at Austin, Port Aransas. Marine Lab.
N. B. Smith.
Limnology and Oceanography, Vol. 22, No. 6, p 1079-1082, November 1977. 4 fig, 6 ref. NPS CX700050448.

Descriptors: *Water temperature, *Coastal marshes, *Variability, *Texas, *Gulf of Mexico, Sampling, Monitoring, Temperature, Measurement, Time series analysis, Diurnal, Winter, Fronts(Atmospheric), Cooling, Coasts, Tidal waters, Estuaries.
Identifiers: *Seagrass flats.

Hourly temperature readings over a 69-day period in winter 1973-1974 were used to characterize both diurnal and longer period temperature variations in a shallow seagrass flat along the Texas coast. The average diurnal temperature variation has a range of about 2.4C and includes 8 h of warming, starting at about 0800, followed by 16 h of relatively slow cooling. Longer term, quasi-periodic temperature variations occur at intervals of 11-13 days in response to frontal passages. Temperatures fall between 8 and 14C in the first 2 days following the frontal passage, before rapid warming begins. (Sims-ISWS)
W78-01981

MEASUREMENTS BY GEOMAGNETIC INDUCTION OF VOLUME TRANSPORT IN A SALT MARSH DRAINAGE CHANNEL.
Woods Hole Oceanographic Institution, MA.
T. B. Sanford.
Limnology and Oceanography, Vol. 22, No. 6, p 1082-1089, November 1977. 5 fig, 15 ref.

Saline Water Conversion—Group 3A

Descriptors: *Salt marshes, *Channel flow, *Drainage, Coasts, Marshes, Coastal marshes, Channels, Flow, Measurement, Instrumentation, Electrical equipment, Tidal marshes, Tidal waters, Wetlands, Estuaries.
Identifiers: Volume transport.

Volume transport of seawater through a salt marsh drainage channel was obtained by geomagnetic induction. The electric potential difference across the channel was interpreted in terms of water motion through the vertical component of the earth's magnetic field. A model was formulated relating volume transport to induced potential differences, and a salt bridge technique was described for measuring the weak voltages. Calibration requires independent measurements of the volume transport. Using surface flow rather than volume transport for calibration results in method errors as large as 25%. Calibration against directly measured volume transport would reduce these errors. (Sims-ISWS) W78-01982

A VISCOUS SEA ICE LAW AS A STOCHASTIC AVERAGE OF PLASTICITY.
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2C. W78-01990

HYDROLOGY OF THE WAIKOROPUPU SPRINGS: A MAJOR TIDAL KARST RESURGENCE IN NORTHWEST NELSON (NEW ZEALAND).
University of Auckland (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2F. W78-02000

THE INFLUENCE OF CRUDE OIL AND MIXTURES OF CRUDE OIL/DISPERSANTS ON THE ONTOGENIC DEVELOPMENT OF THE BALTIC HERRING, *CLUPEA HARENGUS MEMBRUS L.*
Swedish Water and Air Pollution Research Lab., Nyköping, Baltic Sea Lab.
For primary bibliographic entry see Field 5C. W78-02005

THE SEAGRASSES IN THE WADDEN SEA, (IN DUTCH).
P. J. G. Polderman, and C. Den Hartog.
Wet Meded K.N.N.V. (K. Ned Natuurhist Ver). 107, p 1-32, 1975.

Descriptors: Erosion, Europe, Labyrinthula macrocystis, *Netherlands, Pollution, *Seagrasses, Temperature, *Wadden Sea, Wasting, *Zostera marina, *Zostera noltii.

Two species of seagrass occur in the Wadden Sea (Netherlands), *Zostera marina L.* and *Z. noltii* Hornem. Before 1932, *Z. marina* covered extensive areas in the western part of the Wadden Sea; estimates vary from 5000-15,000 ha. In 1932 the sublittoral *Z. marina* disappeared due to the wasting disease, which destroyed most beds of this species throughout the northern Atlantic. The causes of this disease is still uncertain. The unicellular organism *Labyrinthula macrocystis* Cien. has been regarded for some time as the causal agent, but recent studies have shown correlations between the outbreak of the disease and abnormally high summer temperatures. In most areas in Europe and North America, the sublittoral *Zostera* beds have recovered, but in the Wadden Sea there has been no recovery. This is largely due to the coincidence of the outbreak of the disease and the closure of the Zuider Zee. The latter caused considerably hydrobiological changes, resulting in erosion of the substrates formerly occupied by seagrass. Transplant experiments in places of former luxuriant growth were unsuccessful. *Z.*

noltii and the eulittoral and brackish-water populations of *Z. marina* were not affected by the wasting disease. This is one of the reasons that some authors have distinguished these populations of *Z. marina* as separate taxa. After 1965 a marked decrease of the *Zostera* beds in the intertidal belt was noticed. Both species were involved. The increasing pollution of the coastal sea water is the probable cause. At present the only seagrass beds of any importance in the Wadden Sea occur on the Balgzand (mainly *Z. noltii*), the tidal flats south of Terschelling (mainly *Z. noltii*, with many *Z. marina*), the mud-flats south of Ameland (mainly *Z. marina*) and the mud-flat near Usquert (mainly *Z. noltii*), together covering an area of about 500 ha (in 1972).—Copyright 1975, Biological Abstracts, Inc. W78-02045

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED.
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 4A. W78-02119

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES.
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5C. W78-02121

METHOD OF MOVING A FLOATING BODY INTO A PREDETERMINED FLOAT PATH.
Atlantic Richfield Co., Los Angeles, CA. (Assignee).
For primary bibliographic entry see Field 2C. W78-02126

APPARATUS FOR PREVENTING EROSION OF THE SEABED IN FRONT OF HYDRAULIC STRUCTURES.
For primary bibliographic entry see Field 8B. W78-02127

AERIAL MONITORING EXPERIENCE.
Environmental Protection Agency, Edison, NJ. Region II.
For primary bibliographic entry see Field 5A. W78-02167

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION, (VOLUME 2).
National Marine Fisheries Service, Panama City, FL. Panama City Lab.; and National Marine Fisheries Service, Panama City, FL. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 5C. W78-02180

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND.
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A. W78-02192

NITROGEN FIXATION IN SALT MARSHES - A BUILT-IN PLANT FERTILIZER.
Hampshire Coll., Amherst, MA.
For primary bibliographic entry see Field 5C. W78-02193

ALGAL RECOLONIZATION OF SOME CLEARED SUBTIDAL AREAS.
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
For primary bibliographic entry see Field 5C. W78-02196

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI GLASS INDUSTRY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G. W78-01902

3A. Saline Water Conversion

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER.
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 2K. W78-01849

APPARATUS FOR DESALTING SALINE WATER.
Societa Italiana Resine S.p.A., Milan (Italy). (Assignee).
D. Barba, A. Germana, G. Liuzzo, and G. Tagliaferri.
U.S. Patent No. 4,030,985, 9 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1221, June 21, 1977.

Descriptors: *Patents, *Desalination, *Water treatment, *Separation techniques, Water purification, Saline water, Evaporation, Condensation.

Saline water is desalted by flowing it in two evaporation stages in series in the form of a film falling on the inside of heat-exchange tubes. The pressure and temperature in the second evaporation stage are lower than in the first stage. The steam evolved in the second stage is compressed and delivered to the first stage where it condenses on the tubes, whereas the steam evolved in the first stage is fed in the second stage where it condenses on the tubes. The condensation heat of the steam is used for vaporizing the saline water from the film. This technique allows a production of 15-50 cu m/hr of soft water, instead of a production of 15-20 cu m/hr usually obtained by conventional thermocompression techniques. (Sinha-OEIS) W78-02128

ELECTRICALLY REGENERATED ION EXCHANGE SYSTEM.
Sybron Corp., Rochester, N.J. (Assignee).
For primary bibliographic entry see Field 5F. W78-02138

SEMI-IMPERMEABLE MEMBRANE.
Office of the Secretary (Interior), Washington, DC. (Assignee).
H. Yasuda.
U.S. Patent No. 4,032,440, 3 p, 2 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1705, June 28, 1977.

Descriptors: *Patents, *Desalination, *Membranes, *Semi-permeable membranes, *Water quality control, Separation techniques, Membrane processes, Reverse osmosis, Polymers, Chemical reactions, Polymerization.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A—Saline Water Conversion

A semipermeable composite membrane is prepared by glow discharge polymerization of a combination of an organic monomer and an inorganic monomer in the presence of a porous support, the polymerization resulting in deposition of a thin film of copolymer on the surface of the support. The organic monomers found to be most useful in the invention are unsaturated aliphatic or aromatic hydrocarbons, or heteroaromatic compounds, preferably containing about 1 to 10 carbon atoms. The inorganic monomers found to be most useful are carbon monoxide, water vapor and nitrogen. Although the exact mechanism of the polymerization reaction, and the specific structure of the polymer products of the invention, are not known with certainty, it is believed that the process of the invention results in incorporation of hydrophilic groups into the polymer structure, thus enhancing reverse osmosis properties. The desalination devices in which the composite membranes of the invention are typically employed are conventional. (Sinha - OEIS)

W78-02143

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS,
Universal Oil Products Co., Des Plaines, IL. (Assignee).

For primary bibliographic entry see Field 5F.
W78-02154

METHOD AND APPARATUS FOR PURIFYING A LIQUID BY PRESSURE DISTILLATION,
For primary bibliographic entry see Field 5F.
W78-02160

3B. Water Yield Improvement

THE FLORIDA AREA CUMULUS EXPERIMENT: RATIONALE, DESIGN, PROCEDURES, RESULTS, AND FUTURE COURSE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs. W. L. Woodley, and R. I. Sax.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 658. Price codes: A10 in paper copy, A01 in microfiche. Technical Report ERL 354-WMP0 6, January 1976. 222 p, 82 fig, 22 tab, 75 ref, 6 append.

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Florida, *Precipitation (Atmospheric), Rainfall, On-site investigations, Aircraft, Silver iodide, Projects, Cloud physics, Clouds, Storms, Meteorology.

The Florida Area Cumulus Experiment (FACE) is an outgrowth of the single cloud seeding experiments in Florida; the results of which demonstrated that 'dynamic seeding' can be effective in increasing the sizes and lifetimes of individual cumuli and the localized rainfall resulting from them. All aspects of the FACE program were treated in this report to provide a summary of current progress and problems and to serve as a basis for discussion by the scientific community. The plans for the FACE 1975 field program (which has now been completed) were detailed. The motivation, instrumentation, and procedures for each phase of the program were described. Plans beyond FACE 1975 as a function of several contingencies also were mapped. Complete tabulations of single cloud and area rainfalls were provided in the appendices for those wishing to work with FACE observations. The characteristics of the pyrotechnic flares used for dynamic seeding and the FACE cloud physics program also were discussed extensively in the appendices. Answers to questions frequently asked about FACE were provided in the final appendix. (Sims-ISWS)

W78-01975

A SIMPLE MODEL FOR ESTIMATING THE EVAPORATION FROM A SHALLOW WATER RESERVOIR,
Freie Univ. Berlin (West Germany). Inst. fuer Meteorologie.
For primary bibliographic entry see Field 2D.
W78-01998

3C. Use Of Water Of Impaired Quality

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL,
Utah Center for Water Resources Research, Logan; and Consortium for International Development, Logan, UT.
J. I. Stewart, R. M. Hagan, R. J. Hanks, W. T. Franklin, and W. O. Pruitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 466. Price codes: A09 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan, Publication PRWG151-1, September 1977, 191 p, 71 fig, 10 tab, 21 ref, 7 append. OWRB-B-121-UTAH(2) and C-5189(No. 4233)(3), 14-31-0001-5120.

Descriptors: *Optimization, *Crop production, Saline water, *Soil water, Soil analysis, *Salinity, *Irrigation, Plant growth, Moisture content, Root zone, *Soil moisture, *Water management (Applied), Model studies.
Identifiers: Yuma(Ariz), Davis(Calif), Fort Collins(Colo), Logan(Utah).

The research was carried out by four universities belonging to the Consortium for International Development (CID) in cooperation with the four Water Research Centers. Similar field experiments with corn were carried out in 1974 and 1975 at the University of Arizona (Yuma Field Station), the University of California (Davis), Colorado State University (Fort Collins), and Utah State University (Logan). The objectives were to develop production functions for estimating how crop yield is influenced by different levels of salinity and water supply at different stages of crop growth, and to formulate and test models for predicting yields as a function of water and salinity stress across a broad spectrum of climate and soil types. A unique and significant feature of the study was the establishment of a sufficient data base to test the transferability of the results, and to accomplish this feature, the research was conducted on a regional basis with data collection at the four different locations. All irrigation was applied with a line source sprinkler system, developed in Utah, which gave a continuously variable amount of irrigation water on each side of the line. The maximum evapotranspiration (ET) was estimated at all locations and measured with lysimeters at California. Evapotranspiration (ET) was calculated at all plots as the sum of precipitation, irrigation, and soil water depletion minus drainage (estimated). Yields of dry matter and grain were measured at the end of each growing season. This study has provided an extensive data base on how crop yields respond to moisture deficiency and salinity stress under different soil and climatic conditions.

W78-02018

3D. Conservation In Domestic and Municipal Use

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-01865

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01873

3E. Conservation In Industry

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT),
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01722

GEO THERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT,
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 6E.
W78-01724

WATER FOR FOOD AND FIBER PRODUCTION,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-01727

THE SOLAR ENERGY SCENE IN SOUTH AFRICA,
National Building Research Inst., Pretoria (South Africa).
J. F. Van Straaten.
Construction in Southern Africa, Vol 21, No. 5, p 79-95, 1976, 7 fig.

Descriptors: *Solar energy, Economics, Equipment description, Research and development, Domestic water, *Energy conservation, *South Africa.

Solar energy is becoming an increasingly attractive proposition as conventional forms of energy escalate in cost. The United States is spending large sums of money on research and development in this field and it is estimated that by the year 2020 solar energy could account for 25 per cent of United States energy requirements. In South Africa - as this article makes clear - solar energy is already extensively used for water heating while space heating and cooling applications could become common within a few years. (So African Water Info Center)

W78-01830

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 2K.
W78-01849

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-01865

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAL SUMMARY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II. INDUSTRY PRIORITY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III. IRON AND STEEL INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV. PETROLEUM REFINING INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V. PULP AND PAPER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI. OLEFINS INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII. AMMONIA INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII. ALUMINA/ALUMINUM INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01901

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII.

PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01905

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX).

Kappalaverket, Lidings (Sweden).
For primary bibliographic entry see Field 5E.
W78-02025

SOME ION EXCHANGE APPLICATIONS TO RECOVER AND REUSE VALUABLE MATERIALS FROM POLLUTANTS.

For primary bibliographic entry see Field 5D.
W78-02039

RE-USE OF WASTE WATERS.

For primary bibliographic entry see Field 5D.
W78-02041

ARTICHOKE INDUSTRIES—CUTTING BOD BY 95%.

For primary bibliographic entry see Field 5D.
W78-02048

SX'S KEY ROLE: TREATING METAL WASTES.

For primary bibliographic entry see Field 5D.
W78-02053

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED.

For primary bibliographic entry see Field 5D.
W78-02058

SPENT SULPHURIC ACID WASTES CONVERTED TO USEFUL GYPSUM.

For primary bibliographic entry see Field 5D.
W78-02064

TURNING WASTE WATER AROUND.

For primary bibliographic entry see Field 5D.
W78-02065

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.

Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.

Reading, PA. USAC Project.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-236 976. Price codes: A07 in paper copy, A01 in microfiche. HUD Special Technical Report No USAC-RPA2-3241, June 11, 1974. 60 p, 14 fig, 5 append. H-1212.

Descriptors: *Sewerage, *Water supply, *Data processing, *Information exchange, Sewers, Urban drainage, Cities, Computer programs, Water rates, Pennsylvania, Systems analysis, Data transmission, Data storage and retrieval. Identifiers: *Reading(PA), USAC, IMIS, Billing, Meter reading.

Reading, Pennsylvania, an industrial city with a metropolitan area of about 300,000, was one of five cities chosen by the Urban Information Systems Inter-Agency Committee (USAC) to develop integrated municipal information systems (IMIS). Reading was assigned the Physical and Economic Development subsystem (PED), divided into 15 modules. This report describes the Sewer and Water Accounts Processing module (SWAP), which includes gathering and updating customer information, determining customer usage, billing, and recording and maintaining sewer and water accounts. Emphasis has been on computerized data processing and transfer and on integration of data supplied and utilized by various city activities. The total PED structure is designed to become a regional system. The SWAP module uses disc-oriented computer files combined with manual files and operating procedures. Operations performed are: (1) water service application processing; (2) meter reading and calculation of water consumption; (3) billing; (4) cash receipts posting; (5) maintaining customer accounts; and (6) producing periodic reports. The system includes Bureaus of Water (with an Administrative Office, Meter Reading Office, and storeyard), Treasury, Law, Revenue Control, and Management Services (data processing). A detailed description is given of organizational structure, computer programs, and operational requirements. (Lynch-Wisconsin)
W78-02181

3F. Conservation In Agriculture

STRUCTURAL INDICES OF IRRIGATED CALCAREOUS CHERNOZEM, (IN RUSSIAN), Kishinev Agricultural Inst. (USSR).

For primary bibliographic entry see Field 2G.
W78-01705

SOME ASPECTS OF MOISTENING SURFACE FORMATION DURING SPRINKLING (SIMULATED TESTS), (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Soil Science.

For primary bibliographic entry see Field 2G.
W78-01706

PRINCIPLES, METHODS AND RESULTS OF DEFINING WATER-PHYSICAL PROPERTIES OF IRRIGATED SOIL IN ROMANIA, (IN RUSSIAN).

Institutul de Cercetari pentru Pedologie si Agrochimie, Bucharest (Rumania).
For primary bibliographic entry see Field 2G.
W78-01711

SETTING UP CROP ROTATION ON HYDROMORPHIC SOILS IN A MOIST CLIMATE, (IN GERMAN), Zagreb Univ. (Yugoslavia). Zavod Opcu Proizvode Bilja.

V. Mihalic, M. Gikic, J. Gotlin, J. Cizek, and A. Pucaric.
Poljopr Znan Smotra 36(46), p 169-176, 1976.

Descriptors: *Rotation, Grasses, *Climates, Corn(Field), *Crop production, Crop response,

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

Clover, Gley, *Hydromorphic soils, Soybeans, Wheat, *Yugoslavia.

Agricultural experiments were carried out for 4 yr on gley soil in the upper Sava Valley (Yugoslavia) in a moist climate, comparing several systems of field production, to determine which system would best correspond to existing environmental conditions and the requirements of large-scale agricultural production. The 2-field crop rotation, corn (maize)-wheat made the best showing, compared to corn monoculture, 6-field crop rotation with grass-clover mixture and 3-field crop rotation with soybeans. On amphigley soils, crop rotation should make available the free summer period for planting in heavy soil, with the emphasis of fall plowing, as well as timely summer and winter seeding. This objective is achieved by planting early crops within the system of agricultural plant production or by crop rotation.—Copyright 1977, Biological Abstracts, Inc. W78-01712

UNDERGROUND PART OF THE GRASS MIXTURE IN IRRIGATED PASTURES OF THE HILLY RELIEF IN THE LITHUANIAN SSR, (IN RUSSIAN), Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany. N. A. Lapinskene, and L. V. Gutauskas. Liet Tar Mokslu Adad Darb Ser C Biol Mokslai 2, 3-14, 1976.

Descriptors: *Grasses, *Soil moisture, Irrigated lands, *Crops, Alfalfa, Cereal, Clover, Humus, *Lithuanian-SSR, Pastures, USSR.

In June of 1972 and 1973 mixed grass-legume crops (cereal grasses and alfalfa cereals with white and red clovers, cereals) in a hilly area were investigated in Lithuania, USSR. The bulk of the underground part of the plants (58-89% in watered areas and 51-81% in unwatered) accumulated in the soil layer at a depth of 0-5 cm. Decrease of root mass (8 down to 0.6%) was observed at a depth of 25-35 cm. Total underground mass was low due to the lower amount of moisture and humus in the upper slope parts than in the lower.—Copyright 1977, Biological Abstracts, Inc. W78-01713

COMPARATIVE STUDIES ON THE INTER-VARIETAL HYBRIDIZATION OF WINTER SOFT WHEAT UNDER IRRIGATION AND DRY FARMING, (IN BULGARIAN), Bulgarian Academy of Sciences, Sofia. Inst. of Genetics and Selection of Plants. B. Bochev, and D. Ivanka. Genet Sel 9(3): 179-193. 1976. (In Bulg. with Russ. and Engl. summ.).

Descriptors: Belostaya, Cultivars, *Dry farming, Elia, Grain, Heterosis, *Hybridization, *Irrigation, Jubileina, Plant, *Winter wheat.

The influence of irrigation on the inheritance and character of hybrid variability in basic quantity fetures was studied with hybrids of reciprocal 'Bezostaya' X 'Elia' and 'Bezostaya 1' X 'Jubileina II' crosses in relation to their cropping capacity. Grain weight per ear, 1000-grain weight number of productive tillers and stem height showed highest heterotic effect in the 'Bezostaya 1' and 'Elia' hybrids. In most cases irrigated hybrids had a most strongly expressed heterosis effect. The individual features in F2 hybrid populations of the different crosses displayed an unequal diversity when grown both under irrigation and dry farming conditions. A higher degree of variability in the features was observed in hybrids grown without irrigation. A greater possibility of select and more positive transgressions were found under irrigation in hybrids of 'Bezostaya 1' and 'Elia'. The relative share of the genetic control in the total phenotypic variance, expressed by the coefficient of inheritance, was unequal for the separate features in

the different crosses and treatments of growing. Plant height, ear length and 1000-grain weight were distinguished by highest coefficients of inheritance and greatest possibilities of selection, while grain number per ear and number of productive tillers were characterized by lowest coefficients of inheritance, being greatly influenced by environmental conditions. Irrigated hybrids had higher coefficients of inheritance enabling their earlier stabilization, had highest and stable yields in later generations of the crosses. Lines of the 'Elia' X 'Bezostaya 1' cross proved most promising in this respect. Progenies produced and grown under irrigation up to F3 and unirrigated in the following generations behaved differently depending on the meteorological conditions, amount and distribution of precipitation during the growing season, and their genetic origin.—Copyright 1977, Biological Abstracts, Inc. W78-01715

WATER FOR FOOD AND FIBER PRODUCTION.

Texas A and M Univ., College Station. Water Resources Inst. Proceedings of the Texas A and M University Centennial Year Water for Texas Conference, March 25-26, 1976, College Station, Texas, Texas Water Resources Institute, 138 p, 13 fig, 13 tab.

Descriptors: *Texas, *Foods, *Fiber crops, *Agriculture, Conferences, Competing uses, Local governments, Oil industry, Publications, Agricultural engineering, Fibers(Plants), Irrigation, Irrigation practices, Moisture availability, Economics, Elasticity of supply, Water allocation(Policy), Water sources, Irrigated land, Irrigation water.

One of the major uses of water in Texas is for the production of food and fiber. The 8.3 million acres of irrigated land in Texas not only places it third in total agricultural cash receipts nationally but also spawns agribusiness industries such as fertilizer, seeds and farm machinery. Papers presented at the Water for Texas Conference focused upon the technological aspects of food and fiber production as well as the U.S. supply situation for those products. Climate cycles and the impact of energy costs on food and fiber production were also of concern. The impact of bays and estuaries of food demand in the state and nation was discussed. The effect of state and federal environmental constraints placed on irrigation agriculture was the topic of one paper. A final segment of the conference explored competing water used from the oil, gas and power industries as well as the various municipalities. (Moorhouse-Florida) W78-01727

AGRICULTURAL APPLICATIONS OF SOLAR ENERGY.

National Building Research Inst., Pretoria (South Africa). W. N. Cawood.

Agricultural Engineering in South Africa, Vol 10, No 1, p 13-20, 1976. 9 fig, 1 tab, 11 ref.

Descriptors: *Solar energy, *Agriculture, Solar heating, Solar stills, Crop drying, Power generation, Equipment description, *South Africa.

Until the advent of nuclear power all man's energy requirements were provided by solar energy, either directly or indirectly in the form of fossil fuels. Unfortunately man is consuming the remaining fossil fuel reserves at a far greater rate than they are being formed. Accordingly it is essential that alternative energy resources be developed, and that we learn how to exploit the direct applications of solar energy. A high percentage of our energy requirements is at temperatures below 100C, and it is to this aspect that the author considers most solar energy effort should be directed. Solar water heaters are discussed in some detail, as this is the only area where indepth research has

already been conducted, and considerable commercial exploitation has already proceeded. Other areas such as crop drying, space heating, solar distillation and power generation are also discussed briefly. (So African Water Info Center) W78-01844

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975.

Geological Survey, Tacoma, WA. Water Resources Div. For primary bibliographic entry see Field 6D. W78-01865

INVESTIGATIONS OF THE METEOROLOGICAL INFLUENCES ON THE DRY MATTER INCREASE OF SPRING BARLEY AND WINTER WHEAT IN THE PANNONIAN CLIMATE AREA: II. RESULTS OF INVESTIGATIONS IN THE YEARS 1971 AND 1972, (IN GERMAN), Hochschule fuer Bodenkultur, Vienna (Austria). Inst. fuer Pflanzenbau und Pflanzenzuechtung. P. Ruckebauer, and W. Mueller. Arch Meteorol Geophys Bioklimatol Ser B Klimatol Umweltmeteorol Strahlungsforsch. 22(4), p 375-392, 1974.

Descriptors: *Austria, *Barley, Climates, *Dry matter, Growth rates, Hordeum-vulgare, *Meteorology, Pannonian, Radiation, Rainfall, Soils, Spring, Temperature, Triticum-aestivum, *Wheat(Winter), *Plant growth.

The sum of total radiation, the actual soil temperature in 5 cm depth above the 5C level and the energy demand for the evaporation of free water surfaces offered the highest correlation with the growing performance parameters of barley (Hordeum vulgare) and wheat (Triticum aestivum). The influence of other factors and also of rainfall quantity was of lower importance. These correlations are only valid, if sufficient soil water is available, a situation which was given the the cereal growing area in both years. The influence of interception to radiation and rainfall was studied. This value was correlated with the density of the rainfall, and also with the plant height. (See also W74-12729) —Copyright 1975, Biological Abstracts, Inc. W78-01968

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: II. ASSESSMENT OF THE MAIN COMPONENTS OF THE WATER BUDGET,

Institute for Agricultural Research, Zaria (Nigeria). J. Kowal. Samaru Res Bull. 149, p 41-52, 1972.

Descriptors: Agriculture, Hydrology, *Nigeria, Runoff, Samaru, Seepage, *Watersheds(Basins), *Water budget, *Small watersheds, Crops, Evaluation, *Rainfall.

What happens to rainfall in an agriculturally important part of the Northern Guinea Savanna zone in northern Nigeria is discussed. The results based on the study of a small catchment basin indicate that during an exceptionally wet year (54.4 in. of rainfall), run-off and seepage accounted for 33.3% of the received rainfall. In a moderately dry year (39.0 in. of rainfall), a high proportion of rainfall (16.0-27.2%) was still lost in run-off and seepage. The amount of rainfall that can be accepted by soils of the lower and middle slopes of the catchment basin under conditions of normal rainfall distribution and local pattern of agriculture is estimated to be about 44 in. Rainfall in excess of 44 in. must be lost in surface run-off or interflow since the storage capacity of the soil is limited by the depth of the dry-season water-table which, over most parts of the catchment basin, is fairly shallow. The amount of water temporarily accepted by the soil, but then lost by seepage

because of the rise in the water-table was 14.5% of rainfall during an exceptionally wet year and between 10.3-15.3% in a moderately dry year. The maximum rainfall that can be stored and used for dry land farming under the rainfall distribution, topography and cropping pattern as they exist at Samaru is about 36 in. This value can serve as a reference point in classifying seasons as adequate or inadequate in water supply. The mean rate of evapo-transpiration during the main growing period when water was not limited was between 0.159 and 0.176 in./day. (See also W76-01230 and W75-03765)—Copyright 1974, Biological Abstracts, Inc. W78-01971

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN), Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung. For primary bibliographic entry see Field 2I. W78-02013

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL, Utah Center for Water Resources Research, Logan; and Consortium for International Development, Logan, UT. For primary bibliographic entry see Field 3C. W78-02018

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS IN FERTILIZER INDUSTRY, Fertilizer Corp. of India, Trombay. For primary bibliographic entry see Field 5D. W78-02040

IRRIGATION SYSTEM FLUSHING VALVE, Hawaiian Sugar Planters' Association Experiment Station, Honolulu. (Assignee). B. A. McElhoe, and J. G. Tabrah. U.S. Patent No. 4,031,915, 8 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1534, June 28, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Drip irrigation.

A soil irrigating system includes drip tubes connected with a supply of pressurized water to dispense a substantially continuous flow of water to the soil. Flushing valves are connected to remote ends of the drip tubes to periodically flush the tubes clean. Each flushing valve comprises an inlet, an outlet, a pilot opening arranged to introduce pressurized pilot water to the valve, and a valve of resiliently deformable material. The valve has a recessed configuration to extend into a sealing posture in response to urgings of pressurized pilot water at the pilot opening to prevent discharge of water from the remote end of the associated drip tube. When water pressure at the pilot opening is relieved, water pressure from the drip tube shifts the valve to an open position to enable water to be flushed from the drip tubes. A valved manifold is provided to conduct pressurized liquid to the pilot openings to simultaneously shift the valve elements to their closed positions to prevent flushing of the drip tubes. The valve manifold is also able to relieve liquid pressure at the pilot openings so that the valve elements are simultaneously shifted to their open position by water pressure from the drip tubes, to permit flushing of the drip tubes. (Sinha-OEIS) W78-02133

SOIL IRRIGATION METHODS AND APPARATUS, Hawaiian Sugar Planters' Association, Honolulu. (Assignee).

B. A. McElhoe, and J. G. Tabrah. U.S. Patent No. 4,032,072, 8 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1588, June 28, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Flow control, Application equipment, Remote control, Drip irrigation.

An irrigation technique called 'drip' or 'trickle' method which greatly relieves root stress is carried out by a network of conduits placed adjacently to plant rows. The conduits, which can be laid above or below ground are provided with tiny openings. Water is continuously supplied to the conduits to effect a continuous drip or trickle of water through the openings. Water thus distributed to the soil in a continuous fashion eliminates periods where the soil is overly dry. However among the problems characteristics of drip irrigation techniques is a tendency for the drip openings to become clogged. The object of this invention is to provide methods and apparatus by which both drip irrigation and drip-tube flushing can be performed under high water pressure conditions and the network of drip tubes are flushed simultaneously by remote control. The apparatus relies solely upon irrigation liquid as a source of actuating power. A pressure-responsive sealing valve assembly achieves these objects. (Sinha-OEIS) W78-02134

AUTOMATED IRRIGATION SYSTEM, E. F. Jacobi, and M. R. Madden. U.S. Patent No. 4,033,508, 9 p, 12 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 186, July 5, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Water distribution, Automation, Application equipment.

An automated control system for cyclically extending the length of the pivoted irrigation pipe to allow irrigation of the corners is provided. Pivotal articulated pipe is conformed to telescopically receive in the free end a deployable extension. This deployable extension is supported by an articulated undercarriage which, by way of a stepping switch, can be controlled to assume various alignments away from tangent, and thus controls the deployment. Accordingly, concurrent with the pivotal motion of the irrigation pipe, command inputs are applied to this second traveler which by its alignment will then deploy the telescoping extension to reach into the corners. (Sinha - OEIS) W78-02144

LAWN SPRINKLER AND FERTILIZER DISPENSER, K. T. Sheets. U.S. Patent No. 4,033,509, 9 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 186-187, July 5, 1977.

Descriptors: *Patents, *Irrigation, Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Fertilization, Flow control.

An apparatus for incorporating fluid solutions, suspensions, or mixtures of chemicals such as fertilizer, insecticide or weed killer in the fluid spray of the sprinkler is described. The lawn sprinkler contains means for spraying fluid solutions, through the nozzle of the sprinkler. The nozzle is connected to a reservoir chamber by a channel. Liquid is conveyed from the chamber to the nozzle under pressure. A manifold is connected to the reservoir with a flow regulator to regulate the rate of flow of fluids from the reservoir. The reservoir chamber also has an aspirator. (Sinha - OEIS) W78-02145

ARC-TRAVERSING WATER SPRINKLER, Thompson Mfg. Co., Los Angeles, CA. (Assignee). J. M. Jennison, and H. T. Williams. U.S. Patent No. 4,033,510, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 187, July 5, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment.

An oscillating sprinkler is provided that is easily adapted to different water-line pressures and is relatively immune to foreign particles clogging the operation of the oscillating mechanism. The body structure of the sprinkler which moves through a predetermined arc carries a pin which has its extending end formed to provide a pivot surface. The oscillating mechanism has a bearing aperture slightly larger in diameter than the diameter of the body structure pin. One opening of the bearing aperture receives a pin that is inserted into it. The end of this oscillating mechanism pin in the bearing aperture acts as the bearing surface for the body structure pin pivot surface. A support plate carried by the body structure has a bearing aperture to receive the oscillating mechanism pin. This support plate carries a spring mechanism which is attached to the end of the oscillating mechanism pin protruding beyond the support plate, in addition to the support plate. The attachment of the spring mechanism to the support plate is adjustable in a manner that provides a variable rotational force on the oscillating mechanism pin. The spring mechanism is shielded from the elements by a protective housing. (Sinha - OEIS) W78-02146

ALIGNMENT CONTROL SYSTEM PARTICULARLY SUITED TO CONTROL TRAVELING IRRIGATION SYSTEMS, D. E. Sage, and G. E. Sage. U.S. Patent No. 4,034,778, 15 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 616, July 12, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Control systems, Conveyance structures, Strain gages, Strain measurement.

This invention involves the control of an irrigation system for large fields of the type that consists of a series of articulating sections which are independently driven. The control system for such irrigation devices typically operate so that the device pivots around one end of the chain of sections which are kept in substantially linear alignment to permit coverage of a large circular area. The irrigation apparatus may also be operated to travel uniformly across the field. The components of this system are a deflecting member, a strain gauge attached to the deflecting member, a sensor for monitoring the variations detected by the strain gauge and controlling the drive, a sensor for determining the direction of the travel and to modify the signals to the driven control accordingly, and an overtravel sensor to stop the system should the misalignment become excessive. (Sinha-OEIS) W78-02157

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES, Department of Agriculture, Ottawa (Ontario). Engineering Research Service. G. B. Hergert, and J. Gall. Can J Soil Sci. 53(4), p 483-484, 1973.

Descriptors: *Agricultural runoff, *Instrumentation, *Sampling, Pollutant identification, Agriculture, *Automatic sampling, Runoff.

A modification of a Mark IV 24 Bottle Sampler is described which takes samples sequentially at equal time intervals. The instrument may be used

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

in the study of runoff quality from agricultural land. eCopyright 1974, Biological Abstracts, Inc. W78-02185

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A RECALL FOR GREENWAYS,
For primary bibliographic entry see Field 6E. W78-01732

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE, (MEETING 75-4, 1975).
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E. W78-01738

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT),
Systems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B. W78-01739

PLUMBING AND DRAINAGE IN TALL BUILDINGS,
National Building Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 8B. W78-01846

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO—FISCAL YEAR 1977,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D. W78-01858

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
L. R. Peterson, and G. Meyer.
Open-file report 77-596, May 1977. 30 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Water resources development, *Available water, *Investigations, *Planning, *Foreign countries, Surface waters, Rivers, Groundwater, Water supply, Network design, Evaluation, *Nigeria.

Initial moderate water requirements of the new Federal Capital Territory in Central Nigeria are available from the two large rivers, the Niger and Benue, from the smaller Gurara River, and possibly from several smaller streams. Ground water in the southwestern part of the Territory and in adjacent areas along the Niger River is also a potential source. The Niger and Benue Rivers are obvious sources of major supply for eventual large demands, and the Gurara River and sedimentary aquifers also may have that potential. Available data are sparse and highly inadequate for satisfactory design of assessment, development, and management plans for the Territory. Initiation of systematic investigation and collection of data at an early date is recommended. (Woodard-USGS) W78-01859

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E. W78-01866

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
J. C. Stephens.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 56, 1977. 37 p, 3 fig, 9 tab, 39 ref.

Descriptors: *Hydrologic data, *Hydrologic cycle, *Hydrologic budget, *Arid lands, *Utah, Surface-groundwater relationships, Evapotranspiration, Phreatophytes, Precipitation (Atmospheric), Runoff, Ephemeral streams, Groundwater resources, Water quality, Water utilization, Livestock, Water storage, Methodology, Water table, Drawdown, *Tule Valley drainage basin (Utah), *Juab County, Millard County.

The Tule Valley drainage basin is an area of about 940 square miles in Juab and Millard Counties in west-central Utah. Precipitation in the basin averages about 8 inches annually. There is no surface outflow and all streams are ephemeral. Annual runoff averages about 0.09 inch. Because there is no sustained runoff, and flow is local and infrequent, reservoirs do not provide dependable water supplies. Groundwater recharge from precipitation in the basin is estimated to average 7,600 acre-feet annually. Discharge, principally by evapotranspiration, averages about 40,000 acre-feet annually. Subsurface inflow from adjacent areas is estimated to average about 32,000 acre-feet annually. Nearly all discharge from the groundwater system is evaporated directly from the water table or transpired by phreatophytes in the 68,000 acres that constitute a natural discharge area on the northern valley floor. Dissolved-solids concentrations in the water range from 516 to 1,580 milligrams per liter. Water from all sources sampled apparently is of satisfactory chemical quality for livestock use. The temperature of water discharged by spring ranges from 12.5 to 28.0 degrees Celsius. More than 700,000 acre-feet of water might be obtained from storage and by capture of water now being consumed by evapotranspiration if wells in the principal area of natural discharge were pumped to lower the water table 100 feet. Supplies for livestock could be obtained from wells at many locations on the alluvial fans and nearly anywhere on the valley floor. (Woodard-USGS) W78-01872

MAGNITUDE AND FREQUENCY OF FLOODS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2E. W78-01874

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 2E. W78-01875

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C. W78-01882

AQUATIC WEED PROBLEMS IN PUERTO RICO,
Office of the Chief of Engineers (Army), Washington, DC.
For primary bibliographic entry see Field 5G. W78-01921

WATER HYACINTH CONTROL ON THE LOWER FITZROY RIVER,
Queensland Dept. of Primary Industries, Rockhampton (Australia).
For primary bibliographic entry see Field 5G. W78-01922

WATER HYACINTH CONTROL PLAIN FOR THE ST. JOHNS RIVER,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
For primary bibliographic entry see Field 5G. W78-01923

SELECTED LIFE CYCLE FEATURES OF FANWORT,
Florida Dept. of Natural Resources, Tallahassee. D. P. Tarver, and D. R. Sanders, Sr.
Journal of Aquatic Plant Management, Vol. 15, p 18-22, June, 1977. 1 fig, 5 tab, 9 ref.

Descriptors: *Growth stages, *Life cycles, *Life history studies, Aquatic plants, Germination, Pollen, Flowering, Louisiana, Aquatic weed control. Identifiers: *Fanwort, *Cabomba caroliniana, Nymphaeaceae, Bees, Apis mellifera, Pollination, Joyner's Pond (LA), Iatt Lake (LA).

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

A study of fanwort (*Cabomba caroliniana*), a major pest plant throughout the Gulf Coast and especially in Louisiana, deals with seed germination and maturation, flowering, and pollination. Seeds collected in Joyner's Pond (Saline, LA) and Iatt Lake (Grant Parish, LA), were subjected to varying red light, temperature, carbon dioxide, and oxygen conditions. Stem sections containing inflorescences and six leaf pairs, but no roots, were collected in Joyner's Pond and used in laboratory pollination and flowering tests, and field observations were made. While the major growth of fanwort is due to vegetative production, seed germination contributes to its reproductive potential. Germination was achieved by 20% of seeds kept in greenhouse conditions, but no seeds kept in darkness germinated. No significant effects of temperature (10-45 C), red light, oxygen, or carbon dioxide were found in seed germination experiments. Tests and observations indicated that: (1) the pollination mechanism for fanwort is natural cross-pollination by insects and (2) seed development on detached inflorescences can occur, indicating that roots are not essential for successful seed production. The most common pollinator was the introduced honey bee (*Apis mellifera*); others were the dragon fly, damselfly, and sweat bee. No flowers isolated from insects, even those cross-pollinated by hand, developed seeds. Seed-development occurred within 28-31 days of anthesis on successfully pollinated flowers. (Lynch-Wisconsin)
W78-01924

EFFECTS OF CONSECUTIVE WATER FLUCTUATIONS ON SUBMERSED VEGETATION OF BLACK LAKE, LOUISIANA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 5G.
W78-01925

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-01928

MANAGEMENT OF AQUATIC PLANTS WITH ACROLEIN,
Water Resources Commission, Griffith (Australia).
For primary bibliographic entry see Field 5G.
W78-01929

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO

EGGS, ALEVIN, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES,
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01932

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8B.
W78-01973

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I., FLORA AND CHEMISTRY,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W78-02007

JOINT USE OF INTERNATIONAL WATER RESOURCES,
Mahart, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W78-02010

THE LAKE CHELAN CASE—ANOTHER VIEW,
Washington State Bar Association, Seattle.
For primary bibliographic entry see Field 6E.
W78-02098

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING,
For primary bibliographic entry see Field 6E.
W78-02100

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED,
Washington Univ., Seattle. Dept. of Geography.
M. McCrea.
Coastal Zone Management Journal, Vol. 3, No. 1, p. 83-89, 1976.

Descriptors: *Washington, *Shores, *Land management, *Land development, *Governmental interrelations, Urbanization, Local governments, Human population, Economics, Spatial distribution, Industries, Permits, Economic impact, Land use, Shore protection, Pacific Northwest U. S., Water law, *Washington State Shoreline Management Act, *Puget Sound(Wash), Shoreline management, Coastal zone management, Property interests.

Under the Washington State Shoreline Management Act both urban and rural interests have an opportunity to express themselves. The author of this article challenges an article by Peter Harrison on the spatial aspects of the pressure for shoreline development using Puget Sound as an example. In reconsidering Harrison's findings, the author insists that since the Act generally covers only two hundred feet inland from the high tide line, and each local government develops its own management program, it is extremely doubtful that nodal or spread development on a regional level in Puget

Sound can be meaningfully addressed under the Act's provisions. As a result of the Act, local governments have wide latitude in determining the spatial patterns which they deem desirable. The state, however, does provide general guidelines to insure that the policy of the Act is followed. The state also retains the right to protect state interests on shores of state-wide significance. Because each local government now has a greater capability to regulate its shore due to the establishment of a planning department in each county, the author concludes that there may be evidence of nucleation or spread patterns at the local level. (See also W74-05872) (Quarles-Florida)
W78-02119

COMBINED LEACHING AND SUMP CATCH-BASIN,
For primary bibliographic entry see Field 5G.
W78-02131

WATER RESOURCES OF AUSTRALIAN DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 4B.
W78-02163

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY,
W. C. Nelson, and R. J. Ehni.
Farm Research, Vol 34, No 2, p 25-26, November-December 1976. 1 fig, 1 tab, 2 ref.

Descriptors: *Agricultural runoff, *North Dakota, *Land use, Federal Water Pollution Control Act, Simulation analysis, Computer models, Model studies, *Sheyenne River Valley(ND), *Nonpoint pollution, *Cropping patterns, Soil loss.

Interfaces between land use and water quality in the lower Sheyenne River Valley (ND), which is about 90 percent agricultural, were studied with a computerized model that simulates relationships among crop agriculture, the regional economy, and river sediment. Preliminary results indicate soil loss can be reduced and Sheyenne River water quality improved substantially by eliminating summer fallow, limiting row crops and emphasizing production of high value small grains. The eliminations, limitations and crop switches would not only improve water quality but increase per acre profits and regional gross receipts. While results are preliminary, they suggest controlling nonpoint pollution from cropland can be achieved without economic losses for farmers and may, in fact, improve their economic situation. (Coyle-Wisconsin)
W78-02190

BENEFITS OF FLOODWATER MANAGEMENT IN THE CLOSED DEVILS LAKE BASIN,
D. F. Scott, and J. A. Leitch.
Farm Research, Vol 34, No 2, p 27-28, November-December 1976. 1 fig.

Descriptors: *Flood control, *North Dakota, *Wetlands, Flood damage, Regional economics, Cost-benefit ratio, Economic impact, Water management(Appplied), *Devils Lake Basin(ND), *Wildlife production, Economic structure.

The North Dakota legislature in 1975 created a committee to develop and recommend a comprehensive land and water management plan for the Devils Lake Basin. Periodic flooding in the Basin region has seriously damaged agricultural production and depressed economic growth in the region. Attempts to develop flood damage reduction plans for many of the subwatershed areas in the basin have been unsuccessful. The basin is one of the nation's prime waterfowl production areas and there has been opposition to plans that would be detrimental to that production. While work continues on refinement of estimates of benefits and

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

costs associated with reducing flood damage. three alternative plans have been analyzed using benefit-cost analysis. In each instance the benefit-cost ratio is greater than 1.0 for both structural measures and land treatment measures, but less than 1.0 for wetlands restoration. But with adequate compensation to landowners, some wetlands restoration could be justified. (Coyle-Wisconsin)
W78-02191

4B. Groundwater Management

GEO THERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT.
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 6E.
W78-01724

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA.
Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center.
For primary bibliographic entry see Field 5B.
W78-01848

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING.
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5B.
W78-01851

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO—FISCAL YEAR 1977.
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-01858

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA.
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01859

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA.
Geological Survey, Menlo Park, CA. Water Resources Div.
K. S. Muir, and D. A. Webster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 503. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-22, July 1977. 40 p, 8 fig, 6 tab, 27 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Indian reservations, *California, Groundwater availability, Groundwater movement, Water yield, Groundwater recharge, Water levels, Water quality, Surface waters, *Round Valley Indian Reservation (Calif), Mendocino County (Calif).

The Round Valley Indian Reservation in northern California obtains most of its water from the ground-water reservoir. The ground-water reservoir is made up of continental deposits, alluvium, and stream-channel deposits ranging in age from Pliocene to Holocene. Most of the water is

pumped from the alluvium. Most ground water (about 20,000 acre-feet or 25 cubic hectometers per year) is derived from stream seepage. Natural discharge (discharge to streams, evapotranspiration, and underflow) has averaged about 21,000 acre-feet per year. Pumping and flow from artesian wells has averaged about 2,750 acre-feet per year. Ground water occurs in both confined and unconfined aquifers. The ground-water reservoir is full, and about 230,000 acre-feet of water is stored in the depth interval 10-200 feet. The water is chemically and biologically suitable for domestic or irrigation use, although hardness is high for domestic use and, locally, dissolved iron is a problem. There is potential for developing additional ground-water supplies. (Woodard-USGS)
W78-01863

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA.
Geological Survey, Sacramento, CA. Water Resources Div.
R. P. Fogelman, and G. L. Rockwell.
Open-file report 77-486, October 1977. 82 p, 3 fig, 36 maps, 4 tab.

Descriptors: *Groundwater resources, *Baseline studies, *Well data, *Water quality, *California, Water wells, Water yield, Water levels, Water utilization, Drawdown, Chemical analysis, Data collections, Sites, Maps, *Eastern Sacramento Valley (Calif).

The Sacramento Valley occupies the northern one-third of the Great Central Valley of California. The study area of this report includes about 1,300 square miles in the eastern part of the Sacramento Valley, extending from the latitude of Roseville on the south to the latitude of Chico on the north and bounded on the east by the foothills of the Sierra Nevada and on the west by the Sacramento River, in Yolo, Yuba, Placer, Sutter, and Butte Counties. Between February and July 1976, 809 wells were canvassed, and during August and September 1976, water samples were collected for chemical analysis from 222 of the wells. Field determinations of alkalinity, conductance, pH, and temperature were made on the site at the time of sampling. The samples were then field prepared for shipment and analysis for selected constituents and properties at the Geological Survey Central Laboratory, Arvada, Colo. Descriptive data for water wells, chemical data, and the location of wells are presented. This is the third in a series of data reports showing baseline well data and water-quality data in the Sacramento Valley and is in cooperation with the California Department of Water Resources. (Woodard-USGS)
W78-01864

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01868

GROUND-WATER HYDROLOGY AND SUB-SURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-

WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-01869

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01872

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01882

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER.
Southwest Texas State Univ., San Marcos. Aquatic Station.
For primary bibliographic entry see Field 5C.
W78-01920

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS.
Forest Service (USDA), Escanaba, MI. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W78-01949

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
For primary bibliographic entry see Field 5B.
W78-01993

GEOELECTRIC SOUNDING FOR ESTIMATING AQUIFER HYDRAULIC CONDUCTIVITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W78-01994

CLEAT ORIENTATION AND AREAL HYDRAULIC ANISOTROPY OF A WYOMING COAL AQUIFER,
California Univ., Livermore. Lawrence Livermore Lab.
R. Stone, and D. F. Snoeberger.
Ground Water, Vol. 15, No. 6, p 434-438, November-December 1977. 7 fig, 10 ref. ERDA W-7405-Eng-48.

Descriptors: *Hydraulic conductivity, *Anisotropy, *Coal, *Wyoming, Fractures(Geologic), Groundwater, Aquifers, Stratigraphy, Geology, Sandstones, Wells, Water wells, Test wells, Groundwater movement, Hydrology.
Identifiers: *Powder River Basin(Wyo).

The anisotropic, areal hydraulic conductivity of the Felix No. 2 coal (Eocene, Wasatch Formation) was defined in a four-well pump test at a site in the Powder River Basin of northeastern Wyoming. The direction of maximum hydraulic conductivity of the subbituminous coal bed bears N59 deg E and is associated with a horizontal hydraulic conductivity of 0.27 m/day. The direction of minimum hydraulic conductivity bears N31 deg W and is associated with a horizontal hydraulic conductivity of 0.15 m/day. The direction of maximum hydraulic conductivity approximately corresponds to the trend of the prominent face cleat in the coal, while the direction of minimum hydraulic conductivity corresponds to the trend of the butt cleat. The cleat orientation appears related to the alignment of major structural features of the region. Prediction of the direction of both maximum and minimum horizontal hydraulic conductivity in near-horizontal coal beds appears possible. However, either the cleat orientation of the bed or the alignment of the controlling fold structure must be known or obtainable. (Sims-ISWS)
W78-01995

THE SIGNIFICANCE AND PREDICTION OF OBSERVATION WELL RESPONSE DELAY IN SEMICONFINED AQUIFER-TEST ANALYSIS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W78-01996

MEETING THE GROUNDWATER CONTAMINATION PROBLEM,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-02031

INDUSTRIAL DUMPS THREATEN GROUND-WATER.
For primary bibliographic entry see Field 5B.
W78-02043

WATER RESOURCES OF AUSTRALIAN DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
L. A. Dorokhov.
Probl Osvoeniya Pustyn. 1, p 23-33, 1973.

Descriptors: *Australia, *Deserts, *USSR(Central Asia), Water resources, Water supply, *Groundwater.

In Australian deserts runoff is ephemeral and has a wide range of discharge. Underground water is the principal source of the desert water supply. The main hydrologic features of Australian deserts and those of Central Asia (USSR) are compared. Water resource supplementation in Australian deserts is lower than in Central Asia.—Copyright 1976, Biological Abstracts, Inc.
W78-02163

4C. Effects On Water Of Man's Non-Water Activities

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W78-01823

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01873

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
For primary bibliographic entry see Field 5B.
W78-01993

4D. Watershed Protection

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).
For primary bibliographic entry see Field 6E.
W78-01748

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.

D. T. Kao, B. J. Barfield, and A. E. Lyons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 219, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 107, October 1977. 108 p, 15 fig, 4 tab, 18 ref. OWRP A-049-KY(2), 14-31-0001-4017, 14-31-0001-5017.

Descriptors: *Drag, *Flow resistance, *Grassed waterways, Turbulent flow, *Overland flow, Vegetation, Simulation analysis, Flow rates.
Identifiers: *Hydraulic resistance.

Simulated dense vegetation with random blade arrangements and different blade flexibilities were used to determine the hydraulic properties of flow of small, non-submerging depths. With the water flowing among the randomly patterned vegetation blades, drag resistance becomes the dominant force that retards the flow. The equation of flow was established based on the momentum balance in the system. Experimental results were used to determine the coefficient of blade resistance, and plotted in terms of blade width and flow depth

Reynolds number respectively. (Huffsey-Kentucky)
W78-01823

VEGETATION PATTERNS ON A SOUTHERN APPALACHIAN WATERSHED,
Old Dominion Univ., Norfolk, VA. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01943

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN,
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-02017

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY,
For primary bibliographic entry see Field 4A.
W78-02190

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

NATIONAL ESTUARINE MONITORING PROGRAM,
Environmental Protection Agency, Gulf Breeze, FL.
P. A. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 519-521, 2 ref.

Descriptors: *Estuarine environment, *Monitoring, *Pesticides, *Water pollution effects, Estuarine fisheries.

About 8,000 samples of estuarine molluscs were monitored for pesticide residues in the period 1965-1972. Residue trends and typical pollution situations are briefly described. Beginning in 1972, fish were substituted for molluscs. The basic needs for a continuing monitoring program are described. (Sinha-OEIS)
W78-01803

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.

A. C. Miller, L. A. Krumholz, S. E. Neff, D. E. Jennings, and P. B. Olmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 221, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 106, October 1977. 135 p, 25 fig, 27 tab, 136 ref. OWRP B-035-KY(1), 14-31-0001-4087.

Descriptors: *Water quality, *Water chemistry, Sediments, Environmental effects, Limnology, Rainfall, Runoff, *Pre-impoundment, Evaluation, Kentucky, Monitoring, *Salt River(Kent).

Monthly water samples were taken and analyzed to determine the water quality of the Salt River in Anderson and Spencer counties in Kentucky prior to the river's impoundment. Sediments from the

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

area watershed were analyzed by total acid digestion, barium chloride extraction, and aqueous extraction methods. Rainwater and runoff water were collected and analyzed for major cations and anions from two sites in the watershed. Calcium and bicarbonate in the Salt River originate from weathering of calcite, although mole ratios of these two ions suggest that weathering of magnesium carbonates also contributes bicarbonate to the water. High levels of sulfate in rainwater indicate some of this anion may be introduced into the area watershed by atmospheric precipitation. (Huffsey-Kentucky) W78-01822

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER IN SALDANHA BAY AND LANGEBAAN LAGOON. Department of Industries, Sea Point (South Africa). Sea Fisheries Branch. For primary bibliographic entry see Field 2L. W78-01839

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON. Cape Town Univ. (South Africa). Dept. of Geochemistry. For primary bibliographic entry see Field 2L. W78-01842

POLLUTION ESTIMATION FACTORS. Construction Engineering Research Lab. (Army), Champaign, IL. G. W. Schanche, J. R. Cannon, L. R. Greep, and B. A. Donahue. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 753. Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. N-12, November 1976. 26 p, 29 tab, 4 ref. 4A162121A896.

Descriptors: *Pollutant identification, *Waste identification, *Waste disposal, *Waste water(Pollution), Water pollution sources, *Air pollution, Estimating, *Emission factors.

Utilizing an extension of EPA's emission factor approach, estimation is made of the types and amounts of solid waste and wastewater discharged from certain activities common to U.S. Army Training and Doctrine Command (TRADOC) and Forces Command (FORSCOM) military facility and vehicle operation. Army-relevant sections of EPA's 'Compilation of Air Pollutant Emission Factors' (AP-42) are listed. Although the factors are useful for providing preliminary estimates of air emissions from a group of activities without conducting field investigations, they are not precise indicators of air emissions from a specific source; examples for point, line, and area sources are provided for illustrative purposes. Literature-based factors for estimating the quantity and composition of solid waste and wastewater materials are presented. The factors are grouped by facility type with both average and 95 per cent confidence interval values reported for each factor. Examples of these factors, which are to be used purely for general guidance in assessing the environmental consequences of proposed actions and in approximating the magnitude of problems for preliminary planning, are given. (Dorfman-IPA) W78-01850

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA. Environmental Research Lab.-Duluth, MN. For primary bibliographic entry see Field 10C. W78-01852

A SOLID SUBSTRATE IMMUNOLOGICAL ASSAY FOR MONITORING ORGANIC ENVIRONMENTAL CONTAMINANTS. IRT Corp., San Diego, CA. H. R. Lukens, and C. B. Williams. Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 357. Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA/600/1-77-018, March 1977. 40 p, 4 fig, 8 tab, 5 ref, 2 append. 68-02-2202.

Descriptors: *Chemical analysis, Chemicals, Assaying, *Analytical techniques, *Pollutant identification, Monitoring, Environment, *Organic wastes, Chemical wastes, 2-aminobenzimidazole, 2-ABZI.

A solid substrate 'film-badge' type monitor, capable of detecting 2-aminobenzimidazole (2-ABZI) at less than one part per million in water in less than 10 minutes, has been developed. The monitor utilizes both the reaction which takes place between 2-ABZI in the sample and a monolayer of its antibody that has been deposited on a thin film of indium on a glass substrate. A second approach has been demonstrated in principle; the antibody is mounted on polystyrene and reaction of its antigen-binding sites with a fluorescein-labeled antigen are subject to competition with nonlabeled antigen in the sample. Improvements to this alternate approach are proposed. The major disadvantage (correctable, however) is the high level of background fluorescence from the polystyrene, which limits its sensitivity. The potential advantage is quantitative measurement. (Dorfman-IPA) W78-01853

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES. Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer. Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 973. Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA/625-6-76/003, July 1976. Second edition, 298 p, 7 tab, 28 fig, 107 ref, append.

Descriptors: *Pollutant identification, Methodology, Analysis, *Analytical techniques, *Chemical analysis, *Water pollution, *Waste water(Pollution), Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Boron, Chlorides, Organic compounds, Inorganic compounds, Monitoring, Fluorides, Metals, Trace elements, Nitrogen, Phosphorus, Oil, Arsenic, Iodides.

Chemical analytical procedures used in EPA laboratories for the examination of ground and surface waters, domestic and industrial waste effluents, and treatment of process samples are presented. The manual is to be utilized as a basic reference for monitoring water and wastes in compliance with the requirements of the Federal Water Pollution Control Act Amendments of 1972. Test procedures for the measurement of physical, inorganic and selected organic constituents and parameters are included. (Dorfman-IPA) W78-01854

MODEL STATE WATER MONITORING PROGRAM. Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 596. Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-440/9-74-002, June 1975. 61 p, 10 tab, 2 fig, 47 ref.

Descriptors: *Pollutant identification, *Monitoring, *Control systems, *Data collections, *Operations, *Regulation, Environment, Biology, *Management, Water management(Applied), *Operation and maintenance.

A model state water monitoring program, developed by a panel of Federal and State professionals actively engaged in managing and operating such programs, is presented. The objectives were to: (1) provide some basis to the states for building and operating programs; (2) illustrate the various types of monitoring activities, their costs and their uses, and (3) suggest to EPA Regions and States how monitoring resources can be utilized in pollution control and abatement. Areas discussed include planning and management, ambient water quality monitoring, biological monitoring, compliance monitoring, and quality assurance. (Dorfman-IPA) W78-01855

DEVELOPMENT OF HATREMS DATA BASE AND EMISSION INVENTORY EVALUATION. Midwest Research Inst. Kansas City, MO. C. M. Maxwell, R. Bohn, R. Caiazza, and C. Cowherd, Jr. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 634. Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-450/3-77-011, April 1977. 215 p, 7 fig, 20 tab, 16 ref, 5 append. 68-02-2390.

Descriptors: *Pollutant identification, *Fluorides, *Air pollution, *Chlorides, Environment, Chlorine, Data collections, *Emission factors, *Trace pollutants, *Lead, *Emission inventory, Area sources(Pollution).

An extensive data collection and analysis program was conducted to (1) develop an emission factor data base for HATREMS; (2) prepare these data loading into HATREMS; and (3) evaluate emission inventory information from HATREMS. HATREMS (Hazardous and Trace Emission System) is a computerized subsystem of EPA's AEROS (Aerometric and Emission Reporting System), which stores and reports source and emission data for noncriteria pollutants in a manner parallel to NEDS (National Emissions Data System) which stores and reports data for the five criteria pollutants. Three hazardous pollutants (lead, fluorides, and HCl/chlorine) were selected from a list of nine pollutants for incorporation as separate chapters into 'Emission Factors for Trace Substances' (EPA-450/2-73-001); these special report chapters appear as appendices. Point source data were developed/coded for 26 pollutants; area source data for 22 pollutants; and 'free' (non-NEDS) area source data for four pollutants. Methodology was developed for evaluation of the emission inventory information to be generated from HATREMS, even though the HATREMS data base was not processed through the computer system as part of the study. Lead was evaluated for use in the EHIS, another subsystem of NEDS. (Dorfman-IPA) W78-01856

TECHNICAL MANUAL FOR PROCESS SAMPLING STRATEGIES FOR ORGANIC MATERIALS. Monsanto Research Corp., Dayton, OH. W. Fearheller, P. J. Marn, D. H. Harris, and D. L. Harris. Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 696. Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-122, April 1976. 162 p, 20 fig, 9 tab, 46 ref, 2 append. 68-02-1411 Task 11.

Descriptors: *Pollutant identification, Analytical techniques, *Air pollution, *Sampling, Analysis, *Chemical analysis, *Water analysis, *Industrial wastes, *Organic compounds, Industrial processes, *Waste streams, *Environmental assessment, *Fugitive emissions, *Stationary sources(Pollution).

Sampling approaches for conducting Level I, II and III environmental source assessment surveys of the feed, product and waste streams associated

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

with the production of organic materials are examined. Level I presents large quantities of sample in a short time period for both analysis of the chemical classes of compounds present and biological testing programs. Level II presents a more detailed qualitative and quantitative chemical analysis of the organic compounds. Level III is a quantitative study of process variables on the emission rates of specific organic materials. The manual is geared for those basically experienced in sampling techniques and is intended for use in source assessment programs. Specific methods of obtaining samples from stationary sources, fugitive emission sources, and process and waste streams (including gas, liquid and solid phases) are outlined in Level I; state-of-the-art description and an extension of state-of-the-art sampling methods available for application are provided in Levels II and III. Sample survey data sheets are shown, and a fugitive source diffusion model is given. (Dorfman-IPA)
W78-01857

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR GALLIANO, LOUISIANA (LAROSE TO GOLDEN MEADOW, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, LA. Water Resources Div.
H. L. Leone, Jr.
Open-file report 77-576, July 1977. 12 p, 1 fig, 1 plate, 5 tab, 9 ref.

Descriptors: *Environmental effects, *Water quality, *Levees, *Construction, *Louisiana, Flood protection, Hurricanes, Baseline studies, Water analysis, Dredging, Cores, Sampling, Chemical analysis, Heavy metals, Pesticides, *Galliano area (La), Pre-construction data.

Seven core-material-sampling sites were chosen by the U.S. Army Corps of Engineers as possible borrow areas for fill material to be used in levee construction near Galliano La. Four receiving-water sites also were selected to represent the water that will contact the proposed levees. Analyses of selected nutrients, metals, pesticides, and other organic constituents were performed upon these bed-material and native-water samples as well as upon elutriate samples of specific core material-receiving water systems. The results of these analyses are presented without interpretation. (Woodard-USGS)
W78-01861

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01864

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01880

VOLTAOMETRIC DETERMINATION OF ACROLEIN,
Tennessee Valley Authority, Chattanooga, Div. of Environmental Planning.
L. H. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 376, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-005 and TVA report No. E-LB-76-1, July 1976. 42 p, 8 fig, 3 tab, 36 ref, 1 append. E-AP 78BDH, EHE 625C, D6-E721.

Descriptors: *Pollutant identification, *Polarographic analysis, Water pollution, Water sampling, Analytical techniques, Propenal, Molluscicides, Clams, Heat exchangers, Thermal powerplants, *Acrolein.

A differential pulse polarographic method, based on electrochemical reduction of acrolein at the dropping mercury electrode, was developed for determining concentrations of acrolein in natural waters and in condenser cooling water. With this method, acrolein can be quantitated at concentrations of 0.05 to 0.5 mg/l. The sample for acrolein analysis is buffered at pH 7.2 with 0.09 mole per liter phosphate to resist changes in pH, and ethylenediaminetetraacetic acid is added in a concentration of 0.09% to prevent interference from zinc. The recovery of acrolein by this method was unaffected by pH in the 6.8-7.6 range and by zinc at 2.0 mg/l. Replicate analyses at concentrations of 0.1 and 0.3 mg/l acrolein in reagent water gave respective standard deviations of 7.2 and 4.1% and relative errors of 2.8 and 3.3%. Acrolein concentrations can also be determined by differential voltammetry at the glassy carbon electrode. Acrolein is measured indirectly by forming the acrolein-sulfite complex; unreacted sulfite is determined by measuring the oxidizing current at positive potentials in a buffer solution. This procedure's poor sensitivity makes it less attractive than the polarographic method. The effectiveness of sulfite in preserving acrolein could not be evaluated as attempts failed in quantitatively recovering acrolein at 0.5 mg/l in the presence of excess sulfite. The recommended differential pulse polarographic method is presented. (Wares-IPA)
W78-01883

BIOLOGICAL ELECTRODES SPECIFIC FOR PHOSPHATE AND NITRITE IONS,
New Orleans Univ., LA.
G. G. Guilbault.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 233, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/4-76-034, October 1976. 7 p, 11 ref. 1BA027, R800359.

Descriptors: *Assays, Pollutant identification, *Electrodes, Enzymes, Ion exchange, Microenvironment, Biology, *Phosphates, Nitrites, *Chemical analysis, *Nitrites, Ions, *Biological electrodes, Alkaline phosphatase, Glucose oxidase.

Biological electrodes were developed for the selective analysis of phosphate and nitrite ions at

microlevels. A phosphate electrode was constructed by using two enzymes, alkaline phosphatase and glucose oxidase, which were immobilized and mounted on the surface of the platinum electrode. The competitive inhibition of phosphate ion on alkaline phosphatase slows down the hydrolysis of glucose-6-phosphate to glucose, which is subsequently used by glucose oxidase as a substrate in the presence of molecular oxygen. The phosphate ion concentration in the reaction mixture was proportional to the oxygen consumption. The assay of nitrite in the range 10-4M-10-2M was accomplished with the use of nitrite reductase which catalyzes the reduction of nitrite into ammonia. Nitrite could be accurately determined with either soluble or immobilized enzyme using an air gap electrode as sensor. Preparations of benzidine phosphate and hexamino cobalt nitrate in silicone rubber for liquid ion exchange and triphenyltin electrode have been attempted, and results obtained were unsatisfactory due to their poor selectivity. (Wares-IPA)
W78-01885

NITRATE INTERFERENCE IN TOTAL KJELDAHL NITROGEN DETERMINATIONS AND ITS REMOVAL BY ANION EXCHANGE RESINS,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
A. Schlueter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 285, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-017, February 1977. 16 p, 6 tab, 11 ref. EHE625, R-802755-02.

Descriptors: *Chemical analysis, *Spectroscopy, *Sampling, *Nitrogen compounds, *Nitrogen, *Nitrites, Ammonia, *Anion exchange, Pollutant identification, *Kjeldahl nitrogen, Interference.

The interference of nitrate with the determination of total Kjeldahl nitrogen (TKN) was investigated to: (1) confirm the interference of nitrate in the Kjeldahl nitrogen determination; (2) understand the mechanism of the loss of nitrogen; and (3) find a simple, yet effective way to prevent the nitrate interference and enable accurate TKN determination of any sample. TKN losses of greater than 90% were observed in solutions containing a nitrate-nitrogen concentration 10 times greater than the TKN level. The loss was found by infrared spectroscopy to be occurring due to nitrate and ammonia decomposition to nitrous oxide at the elevated TKN digestion temperatures. Prevention of the nitrate interference in TKN analyses was possible only by removal of the nitrate prior to TKN analysis. Several anion exchange resins in the chloride form were effective in this removal. Samples containing known TKN levels and high nitrate concentration when treated by these resins prior to TKN analysis gave nearly 100% TKN recovery on TKN analysis. (Wares-IPA)
W78-01886

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Arthur D. Little, Inc., Cambridge, MA.
D. S. Allan, and G. H. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 655, Price codes: A10 in paper copy, A01 in microfiche. Final Report No. ADL-CG-D-117-76, October 1976. 208 p, 16 fig, 6 tab, 18 ref, 4 append. 4430, DOT-CG-24, 655-A.

Descriptors: Bodies of water, *Water pollution, *Hazards, *Information retrieval, *On-site investigations, *Accidents, Boats, Chemical analysis, Publications, Transportation, Basic data collections, On-site data collections, Coasts, Computer programs, *Hazard assessment, *Hazard response, Discharge (Chemical), Contingency planning.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

Studies related to the major components of CHRIS, for use in U.S. Coast Guard control of transport of hazardous chemicals and response to accidents involving their discharge, are presented. CHRIS was designed to meet field analysis emergencies, by providing information on 400 hazardous chemicals, methods of predicting hazards resulting from their accidental discharge, and procedures for selecting and implementing appropriate responses to discharges. CHRIS is composed of four manuals (a condensed guide to hazardous chemicals, a hazardous chemical data manual, a hazard assessment handbook, and a response methods handbook), a regional contingency plan data base, and a hazard assessment computer system. Additional related work projects have included development of training courses for CHRIS users, a lecture set for describing CHRIS to nonusers, development of a CHRIS-like system applicable to chemical discharges from other transportation modes, identification and assessment of factors influencing method development to ameliorate hazardous effects of chemical discharges into water-bodies, and an inventory of equipment and agents currently available to the U.S. Coast Guard for responding to marine transportation fires. Additional chemical data sheets and hazard assessment models will be added to CHRIS during implementation and test phases. (Wares-IPA)
W78-01887

APPLIED POLAROGRAPHY FOR ANALYSIS OF ORDNANCE MATERIALS. PART I. DETERMINATION AND MONITORING OF 1,2-PROPYLENEGLYCOLDINITRATE IN EFFLUENT WATER BY SINGLE-SWEEP POLAROGRAPHY.
Naval Weapons Center, China Lake, CA.
G. C. Whitnack, and W. J. Becket.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 468. Price codes: A02 in paper copy, A01 in microfiche. Final Report No. NWC TP 5860, Part 1, June 1976. 20 p, 5 fig, 2 tab, 9 ref. Task Area SF57572301.

Descriptors: *Analysis, *Polarographic analysis, *Water pollution, *Water sampling, *Effluents, *Electrochemistry, *Water purification, Chromatography, *1 2-Propyleneglycoldinitrate, Ordnance material.

A rapid, specific, and unique polarographic method of analysis for 1,2-propyleneglycoldinitrate (PGDN) in effluent water is described. A 2-ml or larger aliquot water sample is placed in a quartz cell with mercury anode. The cathode is immersed in the sample in the cell, which is placed in the constant temperature device and brought to constant temperature. The cell solution is flushed with oxygen-free nitrogen, and the start potential of the single-sweep polarograph is set. After several sweeps, a polarogram is recorded with the X-Y recorder. The standard addition technique and recalculation or a previously calculated standard curve of waveheight vs PGDN concentration can be used to obtain a ratio of two recorded polarogram waveheights. A portable and inexpensive digital polarograph and monitoring system are described for field analysis of PGDN. The portable system was demonstrated by analysis of an effluent water sample obtained from a Navy carbon column cleanup process to remove the explosive from Otto Fuel wastewater. Data obtained by the polarographic method of analysis and field equipment developed for its application compared favorably with data obtained by a vapor-phase chromatographic method on the same samples of effluent water. The method is also recommended for analysis of other organic and inorganic pollutants in natural and effluent water. (Wares-IPA)
W78-01888

EFFECTS AND PERSISTENCE OF ENDOTHALIN IN THE AQUATIC ENVIRONMENT.
Wisconsin Univ.-Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5C.
W78-01906

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY.
Texas A and M Univ., Galveston. Dept. of Marine Sciences.
R. J. Scrudato, B. F. Henningsen, and E. L. Estes.
The Texas Journal of Science, Vol. 27, No. 4, p. 419-426, December, 1976. 2 fig, 5 tab, 5 ref. NOAA R/E-7.

Descriptors: *Trace elements, *Metals, Aquatic animals, Estuaries, Rivers, Texas, Lead, Copper, Chromium, Zinc, Cadmium, Oysters, Crabs, Shrimp, *Sabine Lake(TX), Sabine River(TX), Neches River(TX), Crassostrea virginica, Callinectes sapidus, Peneus setiferus.

A study of trace metal concentrations (cadmium, chromium, copper, lead, and zinc) in selected macrofauna in Sabine Lake, Texas, was conducted from 1971 to 1973. The trace metals are known to be discharged into the Sabine and Neches rivers, which drain into Sabine Lake. River waters are used for processing and cooling by upstream petrochemical industries, and sewage is also discharged into the rivers. Sabine Lake is a shallow (2 m average depth) estuary along the Texas-Louisiana border which is connected to the Gulf of Mexico by a narrow tidal inlet. The Lake is 24 km long by 10 km wide. Trace metal concentrations were studied in oysters (*Crassostrea virginica*), blue crabs (*Callinectes sapidus*), and shrimp (*Peneus setiferus*). Results of the study show that lake macrofauna are accumulating trace metals above concentration levels found in associated waters. Trace metal concentrations found do not appear to greatly exceed the limits set by the Texas Water Quality Board. Zinc concentrations range from 21.7 ppm to 1367.9 ppm, copper from 0.1 to 157.6 ppm, cadmium from 0.4 to 4.0 ppm, chromium from 0.1 to 3.7 ppm, and lead from <0.1 to 22.0. A significant difference in metal concentrations was found between 1971-72 and 1973, in particular for lead in *Callinectes sapidus* (1.2-22 ppm vs <0.1 ppm). 1973 was unusually rainy (198 cm) and this 50% increase in rainfall may have diluted the lake waters and caused the decreased lead concentrations. (Lynch-Wisconsin)
W78-01911

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01915

BARIUM BUILD-UP IN THE TEIGN ESTUARY.
Southampton Univ. (England). Dept. of Geology.
J. R. Merefield.
Marine Pollution Bulletin, Vol. 7, No. 11, p. 214-216, November, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Barium, *Estuaries, Sediments, Rivers, Mine wastes, Heavy metals, Mining, Saline water-freshwater interfaces, Mixing, Water pollution sources.
Identifiers: *Teign Estuary(England), Teign River(England), Barytes.

Analysis of sediments in the River Teign of southwest England showed two abnormally rich areas of barium concentration. The first, in the freshwater Middle Teign River adjacent to streams traversing a former mining area, registered a peak

value of 34,052 ppm. The second is located in the freshwater saltwater mixing zone of the Teign Estuary, to the seaward side of the normal tidal limit; the high concentration was 6,919 ppm. Most barium in Teign sediments was present as barytes (BaSO₄) derived from the orefield of the Middle Teign Valley, an area of mineralization scattered with mine dumps. The highest percentage-frequency of barytes relative to total heavy minerals was 41% for the river, and 25% for the estuary. Barium build-up in the upper Teign Estuary seems to be caused by (1) the mineralization-mine dump area 12.8 km from the estuary; (2) mechanical abrasion during transportation; (3) the tidal salt-barrier at the head of the estuary; (4) heavy mineral selection during sediment sorting; and (5) barium transportation in ionic solution and co-precipitation. Estuarine values decreasing toward the mouth suggest that build-up of deposits away from the upper estuary is unlikely. Tidal scour carrying barytes seaward plus the net influx of landward-drifting sediments tends to dilute any potential contribution from barium concentrations at the salt/freshwater interface. It seems likely that barium enrichment in the upper estuary will continue. (Lynch-Wisconsin)
W78-01933

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT.
Woods Hole Oceanographic Institution, MA.
T. J. Lawson, and G. D. Grice.
Bulletin of Marine Science, Vol. 27, No. 1, p. 80-84, 1977. 2 fig, 2 tab, 9 ref. NSF GX-42580.

Descriptors: *Zooplankton, *Sampling, Research equipment, Methodology, Canada, Testing procedures.
Identifiers: *Controlled Experimental Ecosystem, CEPEX program, Saanich Inlet(British Columbia).

In CEPEX program water pollution experiments water columns were entrapped in large plastic bags (controlled experimental ecosystem enclosures or CEEs). Because it was possible to count an entire population from a CEE once an experiment was completed, these enclosures offered a unique opportunity for examining/sampling accuracy under conditions approximating those in the field. Zooplankton sampling techniques were evaluated for sampling variance in a CEE, sample densities vs. those in the CEEs, and the comparability of sampling estimates from different CEEs. A 0.25-scale CEE in Saanich Inlet, B.C., Canada was sampled in two experiments in May-June 1974. A modified Bongo net (202-micron aperture) without closing mechanism was used for collecting samples vertically integrated from 14 m to the surface. A schindler trap was also used, with 202-micron netting, for collecting discrete samples from just below the surface, from 7 m, and from 14 m. Each net filtered about 0.7% of the volume of the CEE. Replication consisted of four vertical net hauls and four trap collections from each of the three discrete sampling depths. Of the four types of samples collected, Bongo hauls and, to a lesser extent, 7-m trap collections were the most precise and accurate. A two- to three-fold change in population estimates would be sufficient to detect pollution effects on density in the CEEs, and population changes in several CEEs are comparable using vertically integrated Bongo hauls. (Lynch-Wisconsin)
W78-01941

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY.
Old Dominion Univ. Research Foundation, Norfolk, VA.
P. Fleischer, T. A. Gosink, W. J. Hanna, J. C. Ludwick, and D. E. Bowker.

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Identification Of Pollutants—Group 5A

Report to NASA Langley Research Center, August 1976. 125 p, 19 fig, 8 tab, 8 ref, 8 append. CR-148803, NAS5h21816.

Descriptors: *Estuaries, *Chesapeake Bay, *Remote sensing, *Satellites(Artificial), Synoptic analysis, Maps, Mapping, Chlorophyll, Attenuation, Suspended solids, Sediments, Tides, Tidal effects, Bays.

Identifiers: *LANDSAT-1, Multispectral scanning(MSS).

Synoptic monitoring of large estuaries is useful for determining circulation patterns, sedimentation, and spatial-temporal productivity. As monitoring of large estuaries is difficult to accomplish by conventional methods, this study was designed to determine which water parameters could be correlated to images produced by the LANDSAT-1 satellite and to test the feasibility of constructing synoptic water-parameter maps from the images. LANDSAT-1 has a 4-band multispectral scanner (MSS); its cycle is short enough (18 days) to monitor seasonal or shorter variations, and its 185 x 185 km image area is sufficiently large to encompass even large estuaries in a single image. The lower Chesapeake Bay-James River system was chosen as the study area. Two principal water characteristics, productivity and suspended material, were selected for correlation with the LANDSAT-1 images. Chlorophyll, particulate counts, attenuation coefficients, and suspended matter were measured over one year using helicopters and baseline transects obtained by surface vessel. Bands 5 and 6 of the multispectral scanner were found to be useful for monitoring total particles, although daily calibration was required. Band 5 had a high correlation with sediment. Attenuation coefficient monitored continuously by ship along three baselines were cross-correlated with radiance values. Evidence for tidal effects was obtained by improved correlations when the ship data was adjusted to 'tidal time'. A contouring program was developed to display a synoptic map of suspended sediment concentration for one overpass. (Lynch-Wisconsin) W78-01946

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. K. W. Thornton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 819. Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-7, December 1976, 73 p, 5 fig, 5 tab, 44 ref, 1 append.

Descriptors: *Dissolved oxygen, *Artificial lakes, Dams, Maine, Lakes, Forecasting, Reservoirs, New England, Flood control, Recreation.
Identifiers: *Dickey Lake(ME), Saint Joan River(ME).

Dickey Lake, a projected impoundment on the Saint John River in northern Maine has been proposed by the U.S. Army Engineer Division, New England. For the purposes of providing peaking power generation (including pumpback operation), flood control, and recreation. The lake would extend 75 km upstream behind a 102.1-m-high dam. If constructed, the lake would be second only to Lake Champlain as the largest and deepest lake in New England. This report is a preliminary evaluation of the dissolved oxygen (DO) regime that might be expected in the proposed lake. Based on a comparison of DO profiles in 25 lakes located in Maine, Vermont, New York, and Quebec, Canada, Dickey Lake is presented to be a dimictic, holomictic lake that will freeze over in winter. During the filling period the reservoir may become meromictic, but is expected to be holomictic after pumpback operations begin. By the second year after complete filling, the lake should have 5 mg/l of DO in the hypolimnion. The DO after stabilization of the lake (6-9 years) is expected to be near

saturation in the epilimnion, and at or above 6 mg/l in the hypolimnion at the end of the summer stratification period. The DO may be lower in the coves and embayments, depending on mesoclimatological events. DO contents approaching 2 mg/l may be expected at isolated times in the hypolimnion of the shallower coves. (Lynch-Wisconsin) W78-01947

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01954

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS.
Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health. C. Faget, N. M. Trief, and G. J. Songer.
The Texas Journal of Science, Vol 27, No 4, p 465-475, December, 1976. 1 fig, 10 tab, 6 ref.

Descriptors: *Water quality, *Baseline studies, Texas, Water temperature, Runoff, Coliforms, Nutrients, Sewage, Industrial wastes, Recreation, Bayous, Algae, Dissolved oxygen.
Identifiers: *Dickinson Bayou(TX).

Water quality baseline data for Dickinson Bayou, Texas were gathered at three sampling sites during the summer of 1972. This slow-moving bayou flows 20-25 mi from its source north of Alvin to Dickinson Bay. It is 8-10 feet deep in Dickinson, and ranges from 25-60 yards in width. Agricultural runoff, and discharge from 60 septic tanks, five sewage treatment plants and one industry contaminate the bayou. Indicators studied were nitrate, nitrate, orthophosphate, pH, temperature, chemical oxygen demand (COD), biochemical oxygen demand (BOD), dissolved oxygen (DO), coliform MPN, fecal coliform MPN, and presence of Salmonella or Shigella. Water temperature in the summer averages 28°C. Results show that pollution exists to a certain extent at all sampling sites. Domestic sewage and land runoff account for high nutrient concentrations and sewage-associated bacteria. Coliform MPN averages 3480-7110/100 ml and indicates pollution from untreated sewage. Fecal coliform MPN averages 1190-2380/100 ml. Elevated COD (average of 102.2-230.3 mg/l) points to the presence of nonbiodegradable wastes, perhaps industrial, and there is potential for eutrophication. The pH is well within normal limits. DO readings vary greatly from day to day and by site; a fish kill of shiners on 31 July at Site 2 is attributed to a low DO level of 0.5 mg/l. Occasionally algal growth will supersaturate the water with DO. (Lynch-Wisconsin) W78-01962

CHEMICAL-PHYSICAL AND BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THE CUYAHOGA RIVER (1973-1974),
Akron Univ., OH. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-01964

DETERMINATION OF SAMPLING STRATEGY FOR BENTHIC MACROPHYTES IN POLLUTED AND UNPOLLUTED COASTAL AREAS,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston, R. S. Lloyd, and M. S. Zimmerman.
Bulletin of Marine Science, Vol. 26, No. 4, p 569-575, 1976. 2 fig, 2 tab, 9 ref. EPA R-803339.

Descriptors: *Sampling, *Benthic flora, Water pollution, Bays, Gulf of Mexico, Data collections, Biomass, Aquatic plants, Algae, On-site data collections, Bottom sampling.
Identifiers: *Apalachee Bay(Fla), Macrophytes, Seagrass.

A series of repetitive samples of benthic macrophytes was used to determine the adequacy of various sampling strategies. Plants were collected at 14 stations in Apalachee Bay (Fla.) on the Gulf of Mexico. Two study areas were involved, one at the mouth of the unpolluted Econfinia River, and one at the mouth of the adjacent Fenholloway River, contaminated by kraft mill effluents. Each station was located so as to represent a broad system, such as a grass bed or mud flat. Samples were taken between February 1974 and June 1975 by means of aluminum hoops 0.25 x 0.25 m dropped randomly into 10 x 15 m areas. Seagrasses and algae within each hoop were gathered by divers. A sample was composed of a series of 16 subsamples (0.25 sq m) taken at each station; at one station 40 subsamples (0.25 sq m) were taken. Total dry weight of the whole plant for each species was determined and recorded by station; relative dominance was computed for each station based on previous data. Using confidence limits, the number of subsamples needed to attain a given percentage of the true mean of biomass of each species was determined. A computer program was developed to determine the number of subsamples needed to achieve various levels of species accumulation. It was found that only a few subsamples were needed to determine the biomass of dominant species, while less common species required more sampling. For species determination, stations with low species diversity and reduced biomass required more samples. (Lynch-Wisconsin) W78-01967

LAKE TAHOE GEOCHEMICAL STUDY. 1. LAKE CHEMISTRY AND TRITIUM MIXING STUDY,
Scripps Institution of Oceanography, La Jolla, CA.
D. M. Imboden, R. F. Weiss, H. Craig, R. L. Michel, and C. R. Goldman.
Limnology and Oceanography, Vol. 22, No. 6, p 1039-1051, November 1977. 4 fig, 4 tab, 38 ref. NSF 29952.

Descriptors: *Geochemistry, *Lakes, *Water chemistry, *Tritium, *Chemical properties, Limnology, Stratification, Chemical analysis, Analytical techniques, Radioactivity, Temperature, Dissolved oxygen, Nitrates, Water quality, Nutrients, Mixing, Hydrogen ion concentration.
Identifiers: *Lake Tahoe, *Tritium mixing study, *Lake chemistry, Reversing thermometers.

The study of vertical mixing in Lake Tahoe by temperature and oxygen measurements was limited to the top layer of the lake, since vertical gradients are extremely small at greater depth. Below 200 m, the temperature gradient is about -0.00016 °C/m, with little or no seasonal variation. A tritium profile was taken at a midlake station in 1973 together with samples for measurements on lake chemistry. Oxygen, nitrate, total inorganic carbon, and pH showed the effects of Photosynthetic activity to a depth of about 80 m, well below the thermocline; average planktonic composition was calculated from the data. Silicate and carbonate alkalinity profiles were essentially uniform, showing that biological removal is negligible in comparison to the rate of vertical mixing. Essentially no variation in tritium concentration with depth was observed. Tritium measurements and input estimates in Crater Lake were used to calculate tritium concentration in Lake Tahoe between 1954 and 1973 and to estimate a ratio in tritium input of 32% precipitation to 68% vapor exchange. The tritium profile gives strong evidence for at least occasional complete mixing of Lake Tahoe. The last complete mixing may have occurred in March 1973, and at least one other such event took place between 1964 and 1968. (Henley-ISWS) W78-01978

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

THE TREATMENT AND ANALYSIS OF CYANIDE WASTEWATER.
Thiokol Corp., Brigham City, UT. Wasatch Div.
For primary bibliographic entry see Field 5D.
W78-02021

THE APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO WASTE WATER ANALYSES USING THE DETERMINATION OF LOW VOLATILITY PETROLEUM-HYDROCARBON COMPOUNDS AS AN EXAMPLE (DIE ANWENDUNG DER DÜNNSCHICHTCHROMATOGRAPHIE IN DER ABWASSERANALYTIK AM BEISPIEL DER BESTIMMUNG SCHWERFLÜCHTIGER MINERALÖL-KOHLWASSERSTOFFE).
Stadt Cologne (West Germany). Abwasserlaboratorium.
H. G. Goebgen, and J. Brockmann.
Vom Wasser, Vol. 48, p 167-178, 1977. 3 fig, 14 ref.

Descriptors: *Water analysis, *Chromatography, *Laboratory tests, *Oil wastes, *Organic compounds, Industrial wastes, Chemical analysis, Analytical techniques, Waste water treatment, *Pollutant identification, Thin-layer chromatography.

A thin-layer chromatographic method has been developed for the determination of higher boiling-point petroleum components, such as paraffins and naphthenes, which have been extracted from sewage and industrial effluents with carbon tetrachloride. Details of the method and its limitations are presented. The presence of other extractable components such as vegetable oils and fats, additives, surfactants, aromatics, and sulfides should not interfere with determinations. The method should provide a rapid, simple, inexpensive means of identifying fuel oil, light lubricating oil, and other heavier oils in waste water. (Schulz-FIRL)
W78-02030

TREATING THE WATER FOR WATNEY'S.

Water and Waste Treatment, Vol 20, No 9, p 48, September, 1977.

Descriptors: Equipment, *Monitoring, Water analysis, *Industrial water, Food processing industry, Hydrogen ion concentration, Analytical techniques, Pollutant identification.

The quantity and quality of water used in the brewing processes as Watney Brewery in Mortlake, England, are being monitored with analytical equipment supplied by Electronic Instruments Ltd., a member of the George Kent Group. The 40,000 gal/hr of raw water used at the Watney Brewery is analyzed with 98 instruments to measure and control the pH at a level of 6.0-6.5. Boiler make-up water used for power generation is mixed with the returning condensate, requiring readjustment of the pH to 9.5-10.0. Temperatures in the five fermenters are measured and controlled with Clearspan P130L instruments which are provided by Foster Cambridge Ltd. The heat exchanger outlet is controlled with three Clearway instruments, and flow measuring devices were provided by Kent Instruments Ltd. (Schulz-FIRL)
W78-02046

MONITORING PLANT EFFLUENT WITH OPEN-CHANNEL FLOW METER.
Vulcan Mold and Iron Co., Trenton, MI.
L. Laux, and M. Neff.
Instruments and Control Systems, Vol. 50, No. 11, p 82, 84, November, 1977. 4 fig.

Descriptors: *Flow measurement, *Flowmeters, *Gaging stations, *Flow rates, Equipment, Industrial wastes, Flow characteristics, Waste water treatment.

Flow measurement was instituted at the Vulcan Mold and Iron Company in Trenton, Michigan, to comply with regulations imposed by the State of Michigan Department of Natural Resources. A mechanical recording American Meter open channel flowmeter system was installed at an 18 inch concentrate pipe which leads to the company's holding pond. A fiberglass Parshall flume restricts the flow in the pipe so that fluid level is a measure of flow rate. A bubbler system, which operates with nitrogen gas, and a circular chart instrument are used to record the liquid level. The American Meter System is used to record flow from the holding pond for a 24-hr period each week. Average flow rates which have been observed with the metering system have been in the range of 50 gpm, while the system is effective over the 0-200 gpm range. (Schulz-FIRL)
W78-02054

AN EXAMPLE FROM THE WESER: CHANGES IN THE BLOOD COUNT OF FISH EXPOSED TO HIGHER CONCENTRATIONS OF POTASSIUM (AM BEISPIEL DER WESER: VERÄNDERUNGEN IM BLUTBILD DER FISCH BEI HOHEREN KALIUMKONZENTRATIONEN).
E. Halsband.
Wasser, Luft und Betrieb, Vol. 21, No. 10, p 548-551, 1977. 7 fig, 1 tab, 14 ref.

Descriptors: Environmental effects, *Potassium, *Bioassay, *Absorption, *Pollutant identification, Toxicity, Fish physiology, Freshwater fish, Water pollution sources, Rivers, Foreign countries, Path of pollutants, Industrial wastes, Waste water disposal, *Weser River (West Germany).

A massive fishkill in West Germany in August 1976 prefaced this investigation into the effects of high potassium concentrations on the blood count of fish collected downstream from a nuclear power plant. Three species of fish, including breams, chubs, and roaches, were collected at seven stations along the Weser River. Parameters measured included hematocrit, erythrocyte count, mean corpuscular volume, hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and the potassium content. The survey indicated that the major source of spent caustic potash in the Weser River was the Werra, a Tributary to the Weser. Analyses revealed that potassium levels in chubs were as much as 540% higher than normal. Current appeals are being directed to East German officials to provide more control over the amount of spent caustic potash discharged to the Werra and Weser Rivers. (Schulz-FIRL)
W78-02063

DAMAGING ACTION OF WATER POLLUTANTS TO DAPHNIA MAGNA (BEFUND DER SCHADWIRKUNG WASSERGEFÄHRDENDER STOFFE GEGEN DAPHNIA MAGNA).
Vienna Univ. (Austria). Inst. fuer Analytisches Chemie.
For primary bibliographic entry see Field 5C.
W78-02067

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

A WASTEWATER TREATMENT STUDY FOR SKOKOMISH SALMON PROCESSING PLANT.
Kramer, Chin, and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 5D.
W78-02071

WASTE TREATMENT FOR SMALL MEAT AND POULTRY PLANTS.
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Food and Wood Products Branch.
For primary bibliographic entry see Field 5D.
W78-02087

EVALUATING AND TREATING POULTRY PROCESSING WASTEWATER.
Richard B. Russell Agricultural Research Center, Athens, GA.
For primary bibliographic entry see Field 5D.
W78-02088

ANALYTICAL VARIABILITY OF FIVE WASTEWATER PARAMETERS - PETROLEUM REFINING INDUSTRY.
Robert S. Kerr Environmental Research Lab., Ada, OK.
L. H. Myers, T. E. Short, Jr., B. L. DePrater, and F. M. Pfeffer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 652. Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-234, September 1976. 67 p, 11 fig, 15 tab, 3 ref, 2 append.

Descriptors: *Analytical techniques, *Chemical analysis, *Oil wastes, *Statistical methods, *Water analysis, Chemical oxygen demand, Suspended solids, Phenols, Oily water, Industrial wastes, Waste water treatment, Analytical error.

A laboratory analysis exercise was conducted by Environmental Protection Agency, industrial, and state agency laboratories to evaluate the repeatability (intralaboratory deviation) and the reproducibility (interlaboratory deviation) in the analysis of waste water obtained from the petroleum refining industry. Samples obtained from the final clarifier effluent at a petroleum refinery activated sludge plant and from the discharge of an American Petroleum Institute separator were sent to 12 laboratories to be analyzed for chemical oxygen demand, suspended solids, ammonia nitrogen, phenolics, and oil and grease. The interlaboratory standard deviations for COD, suspended solids, ammonia, phenolics, and oil and grease were 15.0, 5.2, 0.9, 0.8, and 2.9 mg/liter, respectively. The intralaboratory deviations were 9.5, 1.8, 0.1, 0.2, and 2.3 mg/liter, respectively. Mean values were 134 mg/liter for COD, 19.1 for suspended solids, 8.5 for ammonia, 5.5 for phenolics, and 11 for oil and grease. A summary of a seminar designed to eliminate sources of error and to review analytical procedures in a stepwise manner is presented. (Schulz-FIRL)
W78-02092

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT).
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-02106

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, AND MANGANESE CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA, (IN JAPANESE).
Okayama Univ. (Japan). Inst. of Agricultural and Biological Science.
For primary bibliographic entry see Field 5B.
W78-02151

CLEANING SYSTEM FOR A CONTINUOUS SENSING OIL-IN-WATER MONITOR.
Dresser Industries, Inc., Dallas, TX. (Assignee).
L. R. Loudon, C. A. Blessington, and J. L. Beatty.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

U.S. Patent No. 4,034,219, 8 p., 5 fig., 2 ref.; Official Gazette of the United States Patent Office, Vol 960, No 1, p.403, July 5, 1977.

Descriptors: *Patents, *Water pollution control, *Monitoring, Measurement, Cleaning, *Oil pollution, *Pollutant identification, Oil-in-water monitoring systems.

An oil-in-water monitoring system uses an energy source such as ultra-violet light directed into a sample cell or tube to detect the presence of oil and/or other fluorescing products in the water being monitored. This invention provides a system for keeping the sample cell clean. Sample cells of oil-in-water monitoring equipment have a tendency to become coated and cause inaccurate readings. A source of cleaning solution is provided and means are provided for transmitting the cleaning solution to the sample cell in place of the sample fluid for selected periods at selected intervals. The valve means which channels the cleaning solution may be operated manually or by a programmable device. (Sinha-OEIS) W78-02155

AERIAL MONITORING EXPERIENCE,

Environmental Protection Agency, Edison, NJ, Region II.
P. F. Nixon.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p.6-9.

Descriptors: *Remote sensing, *Aerial photography, Aircraft, Monitoring, New Jersey, Virgin Islands, Water quality, Legal aspects, Regulation, Water quality control, Land use, Water pollution control, Infrared radiation, Helicopters, Enforcement.

Aerial monitoring, which combines sampling and remote sensing, is only in the formation state in EPA's Region II. Two missions have been flown to date; preliminary data indicate that IR imagery is adequate for measuring surface temperature and the size of thermal plumes. Photographs from both high- and low-altitude missions were found in NASA-Houston archives, but extreme difficulty was encountered in procuring copies. The photographs showed that even high-altitude missions were valuable for land use documentation and detection of current patterns in tidal waters, and that normal or infrared-sensitive color photography should be used in addition to thermal infrared imagery. A multispectral approach is preferable to any single technique. Use of a helicopter in a 1971 legal action against New Jersey coastal municipalities reduced survey costs by half and the number of samples required by a third. Collection-to-report turnaround was also reduced by half, and sampling manpower was reduced from eight to two. Aerial photographs were admitted as evidence. (Lynch-Wisconsin) W78-02167

CONTINUOUS MONITORING BB ION SELECTIVE ELECTRODES,

Pittsburg Univ., PA. Graduate School of Public Health.

J. B. Andelman.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IV, p.27-37, 1 fig., 4 tab., 5 ref.

Descriptors: *Monitoring, *Water quality, Pollutants, Water pollution, Instrumentation, On-site data collections, *Pollutant identification, *Sensors, *Electrochemical sensors, *Ion-selective electrodes, Potentiometric sensors, Continuous monitoring.

Ion-selective electrodes, used increasingly for analyzing water and waste water samples, can determine fluoride, chloride, sodium, ammonia, nitrate, calcium, total hardness, sulfide, and cyanide and other parameters. Although used mostly for single samples, ion-selective electrodes can also monitor continuously. Certain limitations must be considered, however, including interferences, the need for pH adjustment, and reference electrode instability. To improve measurement capabilities, additions have been made of pH buffers, salt solutions to control ionic strength, chelators to negate the effects of interfering metals, and ion indicators. Orion Research, Inc. has made several ion-selective electrode monitoring systems available in their 1000 series. A table lists these systems and their characteristics. They use reagent addition techniques to reduce electrode and method interference and control ionic strength, and incorporate ion-selective electrodes such as sodium as reference electrodes to reduce potential drift. They also provide filtration of the sample stream to remove suspended solids, and have temperature control and automatic periodic standardization. (Lynch-Wisconsin) W78-02168

LIDAR FOR REMOTE MONITORING,

National Environmental Research Center, Las Vegas, NV.
S. R. Melfi.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Sect. I, p.39-43, 3 fig.

Descriptors: *Remote sensing, *Air pollution, *Aerosols, Monitoring, Electromagnetic waves, Pollutants, Path of pollutants, Instrumentation, Data collections, *Pollutant identification, *LIDAR, Lasers.

LIDAR, an acronym for Light Detection and Ranging, provides range-resolved measurement of scattered electromagnetic radiation utilizing a pulsed laser as the source of an optical telescope as the receiver. A system is being developed by the National Environmental Research Center in Las Vegas (NERC-Las Vegas) to use LIDAR to assess meteorological and topographical effects on dispersion of pollutants. The LIDAR system is mounted in an aircraft, and the pulse of laser energy interacts with molecules and aerosols as it propagates down from the aircraft. Some of the energy is scattered back toward the telescope. Analyzing the signal as a function of time provides a range-resolved indication of aerosol or particulate concentration; the data is presented to a TV monitor resulting in a display of the aerosol mixing. Analog data are also digitized by the ADC and stored on magnetic tape. (Lynch-Wisconsin) W78-02169

ENVIRONMENTAL KEYS FOR OIL AND HAZARDOUS MATERIALS,

McDonnell Aircraft Co., St. Louis, MO.

C. L. Rudder, and C. J. Reinheimer.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December

1973, Section VI, p.34-46, 12 fig. EPA 68-10-0140 and 68-01-0178.

Descriptors: *Remote sensing, *Oil spills, *Aerial photography, Methodology, Oil pollution, Oil industry, Water pollution, *Pollutant identification, Imagery keys, Imagery.

The design of imagery interpretation keys and their usefulness in extracting information from airborne remote sensor systems is described in a paper that details the application of such a key to oil spill detection. An imagery interpretation key for an aerial photograph of a titanium plant could, for example, take the form of photographic views of each type of facility involved and a chemical flowchart of the operation giving origins and destinations of products and wastes. The interpreter then employs 'deductive analysis' to trace outfall content back to its source. In the absence of such a key, only 'direct analysis' is possible, in which simple geometries and contrasts are evaluated to arrive at conclusions. Thermal imagery from infrared radiation provides additional remote sensing information. A properly constructed key allows combination of photographic and thermal imagery for identification of heat-emitting materials. Multispectral scanner imagery similarly requires knowledge of spectral signatures for interpretation. For development of the McDonnell Aerial Spill Detection Key for Petroleum Refineries, a cartographic camera, multi-band camera array, and low-performance commercial aircraft were used to collect data. Diagrams and photographs are presented to illustrate this key, and a description of its use is given. (Lynch-Wisconsin) W78-02170

DETECTION OF DISSOLVED OXYGEN IN WATER THROUGH REMOTE SENSING TECHNIQUES,

Environmental Protection Agency, Denver, CO.

A. W. Dybdahl.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price code: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section VIII, p.48-66, 5 fig., 3 ref.

Descriptors: *Dissolved oxygen, *Remote sensing, *Aerial photography, Water quality, Films, Filters, Cameras, Monitoring, Eutrophication, Trophic level, *Pollutant identification, Densitometers.

A KS-87B aerial framing camera with Kodak 2443 false color infrared film and a Wratten 16 orange gelatin filter were used to develop a photographic technique for measuring dissolved oxygen (DO) content of bodies of water. Aerial color photographs of water saturated with DO taken from an aircraft at 1/4 to 1/3 f-stop below normal exposure showed as a bright blue, while septic waters (those having near-zero DO) appeared virtually black. Graduations of blue/black were found for intermediate waters. The usual EA-5 chemicals and procedures were used in film development. Ground-truth data confirmed the aerial observations. A Macbeth TD-203AM Transmission Densitometer was used to measure the exposed film, and a curve was generated relating degree of DO concentration to the blue-black/black-black linear progression. This DO remote sensing technique has an accuracy of plus or minus 1 ppm. Interferences which must be considered include under- or over-exposure of the film, lens fall-off, and water discoloration due to turbidity, suspended solids, or industrial wastes. (Lynch-Wisconsin) W78-02171

SCOPE OF RESEARCH NEEDS,
Environmental Protection Agency, Denver, CO.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

For primary bibliographic entry see Field 5G.
W78-02172

SINGLE WAVELENGTH FLUORESCENCE EXCITATION FOR ON-SITE OIL SPILL IDENTIFICATION, J. R. Jadamec.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section VI, p 1-20, 10 fig, 1 tab, 7 ref.

Descriptors: *Oil, *Oil spills, *Fluorescence, *On-site investigations, Spectroscopy, Spectrophotometry, Pollutants, Water pollution, Instrumentation, *Pollutant identification.

Identification and 'fingerprinting' (analysis of the main characteristic of an oil without defraction) of oils by fluorescent techniques directly in the field at the site of a spill appears feasible according to a study in which a single fixed excitation wavelength (254 nm) was used to generate characteristic fluorescence spectra. Spectra were obtained with a Perkin-Elmer MPF-3 Fluorescence Spectrophotometer, equipped with a 150-w xenon lamp, and model QPD-33 recorder. All spectra were recorded at fixed excitation and emission spectral band widths of 34 and 1.5 nm, respectively. Sixteen crude and refined petroleum oils were tested. A table lists the major and minor fluorescent responses for each oil; this data can be used to index oils as a function of fluorescence peak responses when a constant excitation energy is used. In cases where oils have similar peak responses, the use of peak ratios may be of value. Sample preparation and short-term weathering of oils do not significantly affect the fluorescence fingerprint of an oil. (Lynch-Wisconsin)
W78-02173

REMOTE MONITORING IN REGION VI,
Environmental Protection Agency, Dallas, TX.
Region VI.
R. Lozano.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 21-22.

Descriptors: *Remote sensing, *Monitoring, *Oil spills, *Aerial photography, Thermal pollution, Louisiana, Texas, Gulf coastal plain, *Pollutant identification.

In EPA's Region VI remote monitoring has been used primarily for surveillance and analysis, and hazardous materials control; geographically it has been limited to coastal zones, off-shore waters, and rivers. No comprehensive monitoring measurement systems have been developed. Remote sensing was used in the fall of 1970 to monitor thermal discharge from a power plant on Trinity Bay (TX). In 1970-71 an oil-drilling platform off the Louisiana coast burned and spilled oil; thermal infrared aerial photographs were taken of the spill. In the fall of 1972, 624,000 gallons of diesel oil were spilled from a San Antonio (TX) power plant, and seeped through the subsurface into the San Antonio River. Although invisible to the unaided eye, the oil was successfully photographed using a 35 mm camera equipped with a Wratten 39 UV filter and fake infrared film. Color aerial photography was used for an oil spill in the Atchafalaya River Basin (LA) in July 1973, in an area accessible only by air. Following a flood stage of the Mississippi River, 104 leaks and discharges from waste treatment pits were located and described

by means of color and black-and-white aerial photography. Remote monitoring is planned for about 12 of an expected 70 major oil spills in 1974. Remote thermal mapping and multispectral scanner use are projected. (Lynch-Wisconsin)
W78-02174

REGION III'S REPRESENTATIVE REPORT,
Environmental Protection Agency, Philadelphia, PA. Region III.
E. H. Cohen.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 10-14.

Descriptors: *Remote sensing, *Pollution abatement, Monitoring, Air pollution, Water pollution control, Water quality control, *Pollutant identification.

Because of regional limitations, federal assistance is needed for such costly programs as aerial surveillance and photo-interpretation. Use of portable remote sensing instruments would help eliminate the wasted time, expense, hostility, and anxieties which result from court orders for on-site investigations of suspected polluters. Region III suffers from a wide variety of environmental problems including acid mine drainage, oil spills, ocean dumping, municipal and industrial sludge disposal, farm runoff, oil refining, power plants, heavy industry pollution, automotive emissions, and urban solid waste disposal. Internally Region III has encouraged further development of advanced sensors to meet needs for remote air and water pollution monitoring. Currently, low-light image intensifiers are used for visual measurements of air pollution. The needs of various programs are listed. (Lynch-Wisconsin)
W78-02175

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS,
Environmental Protection Agency, Seattle, WA.
Region X.
For primary bibliographic entry see Field 5G.
W78-02176

REGION IV ENVIRONMENTAL MONITORING EQUIPMENT,
Environmental Protection Agency, Atlanta, GA.
Region IV.
E. P. Lomasney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 15-17.

Descriptors: *Southeast U.S., *Monitoring, *Pollution abatement, Water quality control, Water pollution control, Remote sensing, *Pollutant identification, Earth Resources Technology Satellite (ERTS).

In the eight states of the Southeast Region (EPA's Region IV) the diversity of land usage, abundance of dammed freshwater lakes, and the proximity of the Gulf of Mexico and Atlantic Ocean have created conditions which can be adequately monitored only through remote sensing. Areas of most pressing concern are pesticide control, agricultural runoff, thermal pollution, eutrophication, disinfection, and nutrients. Perhaps the most serious problem is contamination and destruction of estuaries through industrial expansion and dredging for landfill. Aerial photography, utilizing

the visual, infrared, and ultraviolet spectra, has promising applications to these problems. Data from the Earth Resources Observation Systems and Earth Resources Technology Satellite (ERTS) programs should be employed. Although some ERTS photographs of the region have been received, there is a lack of information on monitoring activities being conducted in the region. (Lynch-Wisconsin).
W78-02177

REMARKS, REGION IX,
Environmental Protection Agency, San Francisco, CA. Region IX.
D. Longwell.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 29-31.

Descriptors: *Southwest U.S., *Remote sensing, Aerial photography, Sediments, California, Water pollution control, Nevada, Thermal pollution, *Pollutant identification, Plumes.

The Pacific Southwest Region (IX) of EPA includes Arizona, California, Hawaii, Nevada, American Samoa, Guam, and the Pacific Islands Trust Territory. Due to the complex topography and associated environmental problems, remote sensing techniques have great application in the region. An ongoing study of Lake Tahoe is using remote sensing to detect algal growth and sediment plumes. Photographic and thermal infrared imagery were used for an extensive aerial survey of the San Francisco Bay area to identify outfalls. Aerial photographs taken at Moss Landing (CA) and in the Los Angeles area documented sediment plumes for enforcement purposes. Current aerial photography missions include a survey of oil fields in the Bakersfield (CA) area, and a survey of the Las Vegas-Lake Mead vicinity to aid in siting sampling stations. (Lynch-Wisconsin).
W78-02178

REMARKS, REGION VIII,
Environmental Protection Agency, Denver, CO. Region VIII.
R. W. Fitch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 26-28.

Descriptors: *Rocky Mountain region, *Seepage, Brines, Water quality, Water pollution, Salinity, Remote sensing, *Pollutant identification, Nonpoint pollution, Saline seepage.

Region VIII (EPA), which includes Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, three specific areas which need more attention in terms of remote monitoring are saline seeps, nonpoint pollution, and recycled water. Saline seeps, which destroy more land than coal strip mining, have a white crusty appearance when they appear on the ground surface. They tend to be circular and occupy about 1/2 acre. Plant growth in and around them is affected. Region VIII is heavily irrigated, and agricultural chemicals are widely used. Nonpoint pollution problems, including salinity increases in streams and ultimately in the Colorado River, might possibly be monitored by remote sensing techniques. Remote monitoring could also be used for feedlot censuses, assessing the extent of irrigated land and the area and configuration of irrigation canals and ditches, and measuring land slope and soil composition in rela-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

tion to pesticides and herbicides. Water scarcity will increasingly dictate urban water recycling, and remote sensing could aid in measuring the quantity and location of water resources. (Lynch-Wisconsin)
W78-02179

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 3F.
W78-02185

COLLABORATIVE TESTS OF WATER ANALYSIS (THE CHEMAQUA PROGRAMME),
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
C. D. Stevenson, M. Lingsford, and W. H. L. Edgerley.
New Zealand Journal of Science, Vol 19, No 4, December 1976. p. 353-357. 1 fig, 3 tab, 10 ref.

Descriptors: *Water analysis, *Laboratory tests, *Sampling, Water quality, Water quality control, Nitrates, Nitrogen, Phosphorus, *Chemaqua Programme (New Zealand), Sodium arsenate, Mercury chloride, Reactive dissolved phosphorus, Total dissolved phosphorus.

Twenty-three New Zealand laboratories participating in a collaborating international data exchange program (Chemaqua) analysed two synthetic water samples for nitrate, nitrogen, reactive dissolved phosphorus and total dissolved phosphorus. The water for sample preparation was re-distilled from alkaline permanganate solutions to keep low levels of nitrate and phosphorous species. Weighed amounts of dried analytical reagent grade cytidine-5-monophosphate, potassium nitrate, and potassium dihydrogen orthophosphate were dissolved in a large volume of redistilled water. Analar sodium arsenate was added to one solution. Analar mercuric chloride (60 g/cu m) was used as a preservative. Participants could use their current methods and/or recommended methods, but were to explain how their current methods differed from the recommended methods. About 45% of the results for reactive dissolved phosphorus, and 17% of the results for total dissolved phosphorus were subject to interference by arsenate and/or mercuric chloride. If these were not considered, rejection rates for the remainder were 35%, 6%, 31%, and 25%. Coefficients of variation ranged from 3.7-23.6%. (Spaeth-Wisconsin)
W78-02188

WATER QUALITY OF IMPOUNDMENTS ON SURFACE-MINED SITES,
J. E. Gailley, G. W. Gee, and A. Bauer.
Farm Research, Vol 34, No 2, p 37-39, November-December 1976. 4 tab, 2 ref. Old West Regional Commission 10470016.

Descriptors: *Strip mines, *Impoundments, *Runoff, *Land use, *North Dakota, *Missouri River, Hardness (Water), Calcium, Chlorides, Potassium, Sodium, Dissolved solids, Sulfates, *Water soluble constituents, *North American Coal Corp Indian Head Mine, *Sodium adsorption ratio.

Water samples were collected from impoundments on a North Dakota strip mine area and evaluated for livestock and irrigation use. Also analyzed were water samples taken from surface water sites outside the mine complex. The impoundments were at the North American Coal Corporation Indian Head Mine near Zap, ND. Samples were also taken from two stock ponds in the Zap vicinity, from the Spring Creek near Zap and from the Missouri River near Washburn. Samples were taken in November 1975, when conditions were at near minimum pond elevation, and in May 1976, representing conditions following snowmelt.

Evaluation showed variations in concentrations of water soluble constituents between sampling locations. Significant variations in water quality were evident between the November and May samplings. Factors of potential concern included sodium adsorption ratio, total dissolved solids and sulfate. The study notes that complete evaluation would require collection of samples over several years from numerous locations of varying depths. The results are considered tentative and should be reevaluated as more water quality information becomes available. (Coyle-Wisconsin)
W78-02189

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
R. A. Greig, R. N. Reid, and D. R. Wenzloff.
Marine Pollution Bulletin, Vol 8, No 8, p 183-188, August 1977. 1 fig, 2 tab, 10 ref.

Descriptors: *Trace elements, *Chemical analysis, *Neutron activation analysis, Copper, *New York, Chromium, Nickel, Lead, Zinc, Cadmium, Mercury, Cobalt, *Long Island Sound, *Trace metal concentrations, Marine sediments, Silver, Antimony, Selenium, Scandium, Manganese.

Trace metal concentrations in marine sediments from Long Island Sound were measured by comparison with sediments from seven other areas in the U.S. and the United Kingdom. Although baseline data was obtained on the occurrence and distribution of benthic organisms, pathogenic and pollution indicator microorganisms, nutrient levels in water, and trace metal concentrations in sediments, the report discusses only data on trace metals in the sound sediments. Two chemical analysis procedures were used. One procedure was used for neutron activation analysis. Great variation in metal concentrations were found for various Sound locations. Fairly similar distribution patterns were found for copper, chromium, nickel, lead and zinc. For silver, cadmium and mercury, the highest concentrations were in the far western Sound. For the rest of the Sound, no distribution pattern for these three metals could be found. Cobalt, antimony, selenium and scandium were fairly uniformly distributed; distribution of manganese was different from that of all other metals discussed. The comparison with other locations measured only chromium, copper, nickel, lead and zinc. (Coyle-Wisconsin)
W78-02192

5B. Sources Of Pollution

THE HYDROCARBON BURDEN IN THE MARINE ENVIRONMENT SURROUNDING A REFINERY TANKER JETTY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
B. H. Gump, H. S. Hertz, W. E. May, and S. N. Chesler.

Journal of Environmental Science Health, Vol A12, No 3, p 105-113, 1977. 2 fig, 1 tab, 7 ref.

Descriptors: *Water pollution sources, *Environmental effects, *Sediments, Resources development, Jetties, Bottom sediments, *Oil spills, *Outer Continental Shelf, Refineries, Docking facilities, Transshipment.

In an investigation of petroleum hydrocarbons in the vicinity of a refinery docking facility in a 'clean' environment, water samples taken from the surface and at a 10-m depth and sediment samples taken from a nearby beach were found to have essentially no contamination, while bottom sediment had a low level hydrocarbon contamination. Of particular interest was the relative abundance of benzo(a)pyrene in the bottom sediment. (Sinha-OEIS)
W78-01707

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION,
Environmental Impact Planning Corp., San Francisco, CA.

H. A. Feibusch.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 409-414, 1 tab, 8 ref.

Descriptors: *Estuaries, *Water pollution sources, *Solid wastes, *Waste disposal, Pollution abatement, Federal government, *Outer Continental Shelf, Government policy.

The general relationship of solid waste to estuarine pollution is described. Current major impact of solid waste on estuarine pollution comes from fills, legal and illegal, where leachates contain pollutants including pesticides, heavy metals, and oxygen-demanding materials. Most coastal states have regulated against further use of estuarine areas for the disposal of solid wastes. It is recommended that the Federal government establish a data bank to determine where the various kinds of waste materials originate and where they are disposed. Long-range solutions to the danger of estuarine pollution by solid waste materials lie in reduction of the quantity of solid wastes generated and in large-scale recycling efforts. (Sinha-OEIS)
W78-01794

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
E. W. Davey, and D. K. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 445-449, 1 fig, 3 tab, 7 ref.

Descriptors: *Estuaries, *Mercury, *Food chains, *Water pollution effects, Toxicity, *Metals, Ecosystems, *Outer Continental Shelf, *Trace metals, Biological effects.

Increased input of mercury to the estuarine environment resulted in bioaccumulation in marine food chains that affected man. Toxic effects of other metals on marine animals has been demonstrated under laboratory conditions. However, cause and effect between elevated environmental metals levels and toxicity to marine animals has yet to be conclusively demonstrated under field conditions. Municipal waste water treatment plants, dredging and spoiling activities, and the dumping of sewage sludge and industrial wastes are the major sources of metals to the marine environment. These sources are likely to increase in the future unless the Federal Water Pollution Control Act Amendments of 1972 (PL-92-500) are carefully enforced. (Sinha-OEIS)
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.

M.-Y. Li.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 451-466, 1 fig, 6 tab, 65 ref.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

Descriptors: *Estuaries, *Water pollution sources, *Agriculture, *Pesticides, Ecosystems, Aquatic life.

Agricultural pesticides enter the estuarine environment by several means: direct application to water; runoff from treated lands; industrial discharges; domestic sewage; atmospheric drift; and accidental spills. A recent national survey on organochlorine residues in estuarine mollusks reveals that 'at no time were residues observed of such a magnitude as to imply damage to mollusks.' However, residues were large enough to pose a threat to other elements of the biota through recycling and magnification. The maximum pesticide residues can be correlated with proximity of monitoring stations to agricultural runoff. Long-term, sublethal effects of pesticides in estuaries are difficult to assess at present, as most data on pesticide effects are limited to a few species and concentration that is lethal in short-term tests under laboratory conditions. Pesticide pollution in the estuarine environment can be minimized through the use of alternative pesticides, more effective use of pesticides, removal of pesticides from water, improvement of farm management practices, regulatory control of pesticide use, and a better understanding of the pesticide behavior in the estuarine ecosystem. (Sinha-OEIS) W78-01798

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,

American Petroleum Inst., Washington, DC.
K. G. Hay.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 467-474.

Descriptors: *Estuaries, *Environmental effects, *Resources development, *Water pollution, *Offshore platforms, Monitoring, Oil pollution, *Outer Continental Shelf, Petroleum operations, Marine environment.

America is facing a serious energy crisis, as domestic petroleum supplies are consumed at a greater rate than new reserves can be located and placed in production. It is necessary to the nation's economic and political security to expand the search for crude oil and natural gas into the frontier areas of our Outer Continental Shelf. Expertise gained through more than two decades of exploration for and production of crude oil and natural gas in the Gulf of Mexico, and the advances in exploration, drilling and production technology and equipment, minimize the danger of environmental damage from offshore petroleum operations. Studies of the impact of oil on the marine and estuarine areas are continuing, and the results so far indicate that petroleum operations can be and are being conducted in an environmentally acceptable manner. (Sinha-OEIS) W78-01799

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,

California Univ., Berkeley.
H. B. Fischer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 477-485, 10 fig, 10 ref.

Descriptors: *Estuarine environment, *Circulation, *Water pollution, *Water quality, Dispersion, Pollutants, Flushing rate.

One important feature of estuaries is their ability to assimilate wastes and transport them to the ocean. This paper discusses how flushing rates can be quantified, predicted, and used as part of the process of specifying allowable waste loadings. The various mechanisms which, in concert, drive the circulation of the ocean water is discussed. A practical analysis for computing flushing rates are described as well as procedures that can be used in a more predictive way, but are still in a state of research and development. Finally both practical needs relevant to current legislation and longer-term research needs are discussed. (Sinha-OEIS) W78-01800

A BRIEF ASSESSMENT OF ESTUARY MODELING—RECENT DEVELOPMENTS AND FUTURE TRENDS,

Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 2L.
W78-01804

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA,

Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center.
T. L. Sole, C. W. Byrer, H. W. Rauch, and W. K. Overbey, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as MERC/TPR-76/5, Price codes: A04 in paper copy, A01 in microfiche. Report MERC/TPR-76/5, July 1976. 50 p, 14 fig, 5 tab, 21 ref.

Descriptors: *Baseline studies, *Water pollution sources, Control, Water quality standards, Aquifers, Testing, Coals, Manganese, Lead, Iron, West Virginia, *Underground coal gasification, Arsenic, Coal gasification.

Baseline data on water quality and aquifer properties for the area surrounding the Underground Gasification of Coal (UGC) Project, near Pricetown, West Virginia, are presented. Stratigraphic and domestic water well studies indicate that most wells are in shale aquifers of the Middle Dunkard Group; these wells yield about 1 to 8 gallons per minute of relatively good-quality water, except for excessive dissolved iron, manganese, arsenic, and lead in some. Moderate to low permeabilities of 0.032 to 0.18 millidarcies and transmissivities of 268 to 1,003 gallons per day per foot were measured for shallow aquifers. Aquifer permeability and well productivity are significantly higher for wells within 35 feet of mapped fracture traces. Geologic information was derived from fieldwork, well logs, and previous investigations. Most wells were less than 100 feet in depth, top shale aquifers, and exhibited good water quality. Results of the hydrologic assessment indicate that fracture zones are the primary avenues for migration water pollutants. Domestic wells within one mile of the underground coal gasification site should be periodically monitored (at least twice a year) for water quality after coal burning begins, and nearby surface sources of ground water contamination not related to the UGC project should be carefully checked out. (Wares-IPA) W78-01848

POLLUTION ESTIMATION FACTORS,

Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 5A.
W78-01850

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING,

Battelle Columbus Labs., OH.
A. K. Reed, H. C. Meeks, S. E. Pomeroy, and V. Q. Hale.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 413, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-76-036, December 1976. 50 p, 6 fig, 10 tab, 19 ref. 68-02-1323.

Descriptors: *Mining, *Mills, *Mine acids, *Mine drainage, Environment, *Environmental effects, *Underground mining, *Waste treatment, *Waste disposal, Mine water, Acid mine water, Research and development, Deep wells, Reclamation, Water reuse, *Uranium, Tailings ponds.

The characteristics and locations of domestic uranium ore reserves, and conventional methods for mining and milling of these ores are reviewed. Potential environmental impacts associated with the entire cycle from exploration and mining to recovery and production of yellowcake are identified and discussed as are land reclamation aspects. Mining methods: (1) open pit-acid leach process, (2) underground-acid leach process, (3) underground-alkaline leach, and (4) in-situ mining are discussed from the standpoint of typical active mills, which were visited during the program. Flowsheets indicate specific environmental aspects. The use of tailings ponds and deep well injection to dispose of the more toxic chemical wastes represent the major focus to be considered in future environmental studies. With regard to reclamation, additional research is needed in the development of plant species that are adaptable to reclamation needs and in the development of alternative uses of disturbed lands which cannot be restored to their prime condition. (Dorfman-IPA) W78-01851

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO—FISCAL YEAR 1977,

Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-01858

GROUND-WATER HYDROLOGY AND SUB-SURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK,

Geological Survey, Albany, NY. Water Resources Div.
D. E. Prudic, and A. D. Randall.
Open-file report 77-566, July 1977. 28 p, 14 fig, 2 tab, 10 ref.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Landfills, *Path of pollutants, *New York, Groundwater movement, Aquitards, Radioactive well logging, Hydrogeology, Till, Radioisotopes, Water level fluctuations, Evaluation, *West Valley(NY).

Burial trenches for disposal of solid radioactive waste at West Valley, N.Y., are excavated in till that has very low hydraulic conductivity (about 5 x 10 to the minus 8th power centimeters per second). Fractures and root tubes with chemically oxidized and (or) reduced soil in their walls extend to 3 to 4.5 meters below natural land surface. Preliminary simulations of pressure heads with a digital model suggest that hydraulic conductivity is an order of magnitude greater in the fractured till near land surface than at greater depth. Hydraulic gradients are predominantly downward, even beneath small valleys. The upper part of a body of underlying lacustrine silt is unsaturated; in the lower, saturated part, slow lateral flow may occur. In the older trenches, water began to build up in 1971, overflowed briefly in 1975, and was pumped out in 1975-76. Water levels rose abruptly during major rainstorms in mid-1975, indicating rapid infiltration through cracks in the cover material. The new trenches have maintained low, stable water levels, perhaps because of thicker, more compact cover

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

and less waste settlement; pressure heads near these trenches are low, locally approaching zero, perhaps because of slight infiltration and limited near-surface storage. Peak tritium concentrations in test-hole cores (generally 0.00001 to 0.001 microcuries per milliliter) were found within 3 meters of land surface and are attributed to surface contamination. Concentrations declined rapidly with depth within the fractured till; secondary peaks found at about 9 meters in three holes are attributed to lateral migration from trenches. Other radioisotopes were detected only near land surface. Samples from the walls of shallow fractures revealed no accumulation of radioisotopes. (Woodard-USGS) W78-01869

VOLTAMMETRIC DETERMINATION OF ACROLEIN.

Tennessee Valley Authority, Chattanooga, Div. of Environmental Planning. For primary bibliographic entry see Field 5A. W78-01883

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS.

Bureau of Mines, Spokane, WA Spokane Mining Research Center. R. R. Backer, R. A. Busch, and L. A. Atkins. Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 724. Price codes: A03 in paper copy, A01 in microfiche. Bureau of Mines Report of Investigations No. Bu-Mines RI 8216, 1977. 29 p, 17 fig, 9 tab, 12 ref.

Descriptors: *Coals, *Waste dumps, *Physical properties, *Chemical properties, Geographical regions, Mining, Soil mechanics, *Coal mine wastes, Waste dumps, Liquefaction.

The typical physical and chemical properties of coal waste material from the western part of the United States are reported and compared where possible with the properties of waste materials from eastern coal operations. A disparity exists among mines and preparation plants in the western U.S. coal operations; dissimilarities are also evident in comparison with typical operations in the East. The relatively cleaner product from the predominance of surface mining and occurrence of thicker seams in the West reduces the amount of coal preparation required and the size of the waste piles. Many of the waste piles are low and extended over large areas, since an abundance of land has been available for waste disposal. New concepts relating statistical shear strength data to liquefaction potential are presented; the limited data available show the western coal sludge to be coarser, with higher permeabilities and shear strengths, than the eastern coal. Results are recommended for use in planning and evaluating coal waste pile construction. (Wares-IPA) W78-01884

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS.

Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering. C. P. Hwang, T. H. Lackie, and P. M. Huang. Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2754-2760. December 1976. 3 fig, 3 tab, 6 ref. National Research Council of Canada A3248.

Descriptors: *Phosphorus, *Adsorption, *Sediments, Lakes, Reservoirs, *Canada, Particle size, Nutrients, Laboratory tests, *Blackstrap Lake(Canada).

Sediment samples collected from six locations in Blackstrap Lake, Saskatchewan, Canada, were tested for inorganic phosphorus adsorption related to sediment particle size. Blackstrap Lake, a large reservoir created in 1967 on the South Saskatchewan River, is 14 km wide and averages

5.2 m depth. Samples were collected from places generally less than 2.54 cm in depth. The sediment was mixed thoroughly to make a composite which was then dispersed in distilled water; the sediment was subsequently separated into <0.2, 0.2-2, 2-5, 5-20, 20-50, and >50 micrometer fractions. Inorganic phosphorus solution prepared from anhydrous potassium dihydrogen phosphate was selected as adsorbate. Results indicated that the adsorption characteristics of various-sized fractions of lake sediments are significant for both colloidal fractions and noncolloidal fractions. The best adsorption efficiency was observed at 2-5 micrometers. Other conclusions were: (1) composite sediment adsorption of inorganic phosphorus was directly proportionate to the initial phosphorus solute concentration; (2) greater gyration of the shaker resulted in somewhat higher adsorption; (3) finer particles had a higher adsorption potential than coarser ones; (4) the sum of the adsorption capacity of different sediment fractions was 81% that of the composite sediments; and (5) the adsorption rate of the composite calculated from the fractions was 67% of that in the actual test of the composite sediment. (Lynch-Wisconsin) W78-01907

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT.

Marine Lab., Aberdeen (Scotland). For primary bibliographic entry see Field 5C. W78-01916

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS.

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences. For primary bibliographic entry see Field 5C. W78-01935

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES.

New Jersey Agricultural Experiment Station, New Brunswick. J. K. Shisler, and D. M. Jobbins. Marine Biology, Vol 40, No 2, p 127-134, 1977. 3 fig, 6 tab, 21 ref.

Descriptors: *Carbon, *Organic matter, *Tidal effects, *Salt marshes, Detritus, *New Jersey, Estuaries, Marshes, Streams, Tidal streams. Identifiers: *Organic carbon.

This study compares the movement of organic carbon in several small tidal creeks in a half-managed and half-natural marsh at Tuckerton, N.J., over several tidal cycles using a simulation program. Three natural tidal creeks in the natural marsh were chosen to correspond in size to three constructed ditches in the managed marsh. Dissolved organic carbon (DOC) and particulate organic carbon (POC) were monitored. The study concludes that individual marshes, creeks, and tidal cycles cannot be used to determine actual movement of organic components. In addition, one organic component cannot be used to characterize the net movement of other organic components in the estuarine system. The overall means of all samples within a creek for a single date or series of dates do not accurately estimate the creek's organic carbon movement, as organic carbon concentrations may persist for short periods of time in small volumes of water in the tidal cycle. The spring tide showed significantly higher organic carbon concentrations in the latter segments of the tidal cycle than the other two tidal cycles; precipitation seems to have been the only reason for the difference. Organic carbon components showed lower concentrations at flood slack than at ebb slack. Mid-ebb concentrations were significantly higher than mid-flood concentrations for TOC and POC. (Lynch-Wisconsin)

W78-01938

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN.

Scripps Institution of Oceanography, La Jolla, CA. E. D. Scura, and G. H. Theilacker. Marine Biology, Vol 40, No 4, p 317-325, 1977. 2 fig, 4 tab, 35 ref. NSF-IDOE GX-32977.

Descriptors: *Food chains, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Trophic levels, Algae, Rotifers, Aroclors, Industrial wastes, Water pollution, Pollutants, Marine microorganisms, Laboratory tests. Identifiers: Bioamplification, Dunaliella, Brachionus plicatilis, Anchovies, Engraulis mordax.

The concentration of PCB in each trophic level of a three-step marine food chain (algae, rotifer and anchovy larvae) was monitored for 45 days. Transfer of chlorinated hydrocarbons (CHCs) in such chains was simulated in the laboratory using the algal flagellate *Dunaliella* sp., the rotifer *Brachionus plicatilis*, and northern anchovy larvae *Engraulis mordax*. Most investigators agree that aquatic organisms accumulate CHCs either by eating contaminated food or by a partitioning of the compounds directly from the water into the lipid until an equilibrium is established. Since partitioning occurs between polar and nonpolar phases, the seawater used in the tests were kept free of even trace amounts of organic solvents which could affect the partitioning. In addition, CHC levels in the test seawater were representative of seawater off southern California. The data indicate that CHC accumulation is the result of direct partitioning of the compounds between the seawater and the test organisms, and not a food-chain phenomenon. Unfed anchovy larvae accumulated the same amount of CHC as fed larvae, and the final concentration appeared dependent of the CHC concentration in the seawater. When the PCB concentration was calculated on a lipid basis, algae and rotifers contained essentially the same levels, and what had appeared to be a food-chain accumulation was really a reflection of the greater amount of lipid in the rotifers. However, PCB residues in fish larvae lipid were ten times greater than in the invertebrates, apparently contradictory evidence supporting bioamplification. (Lynch-Wisconsin) W78-01939

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS.

Battelle Columbus Labs., OH. For primary bibliographic entry see Field 5C. W78-01944

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE.

Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. For primary bibliographic entry see Field 5A. W78-01947

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS.

Forest Service (USDA), Escanaba, MI. Hiawatha National Forest. N. Johnson, and D. H. Urie. Ground Water, Vol 14, No 6, p 403-410, November-December, 1976. 5 fig, 4 tab, 3 ref.

Descriptors: *Recreation wastes, *Sewage disposal, *Waste disposal, Wastes, Sewage, Organic wastes, Water quality control, Nutrients, Coliforms, Biodegradation, Groundwater, Water table, Michigan, Water pollution sources. Identifiers: *Soil incorporation, *Land disposal.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

Sealed concrete vault toilets were installed in campgrounds in northern Michigan's Hawatha National Forest because the extremely sandy soils with high percolation rates and little capacity to renovate waste. Three available methods for disposal of the waste pumped from the vaults were rejected: spreading on the ground for biodegradation, transfer to municipal waste treatment plants, and a new treatment facility on the grounds. A soil incorporation method proved to be reliable and economical (\$2,000/yr to dispose of 57,000 l of wastes). According to this method sewage is injected into furrows 0.69 m apart and 10-20 cm deep by a tank trailer which opens the furrows, injects the sewage, and closes the furrows in one operation. Bacterial, nutrient, or viral contamination of the ground water is unlikely if the site (1) has a ground water level at least 3 m below ground level, (2) has good soil development, and (3) operates under normal precipitation conditions. The system depends on filtration by the soil above the ground water table and nutrients being used by vegetation. Preferred soil textures in decreasing order (all well-drained) are: sandy loams, fine sandy loams, loamy sands, sands, and loams. The site must be at least 180 m from the nearest residence or travel lane, preferably one-half mile. Application rate must not exceed 6.2 liters of waste per m of furrow, and the slope should not exceed 5%. Reapplication is possible after three years. (Lynch-Wisconsin) W78-01949

WEST VIRGINIA ACID MINE DRAINAGE STUDY IN NORTH POTOMAC RIVER BASIN. West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources. July, 1974. 77 p., 23 fig., 2 tab., 1 append.

Descriptors: *Acid mine water, *Mine drainage, *Potomac River, *West Virginia, Effluents, Watersheds(Basins), Water pollution, Water quality, Tributaries, Rivers, Streams. Identifiers: *North Branch Potomac River Basin(WV and MD).

Earlier studies of the North Branch of the Potomac River indicated that mine drainage emanating from West Virginia and Maryland was responsible for acid pollution of the North Branch. This study was undertaken to locate and map all acid mine drainage sources in West Virginia, measure stream flow, analyze water samples, and research historical and geological information. Using results of a federal water pollution control study made in 1968-69, trends in the acidity of streams from 1968 to 1973 were established. It was concluded that current coal mining, rather than old abandoned mines, was responsible for the generation of acid in the West Virginia streams of the North Branch Potomac Basin. From 1968-72 probably over half of the acid in the North Branch Potomac at the Barnum monitoring station came from Island Creek Coal Company's Alpine and North Branch mines. Acid discharge from the Alpine Mine was reduced substantially over the period, but discharge from the North Branch Mine increased enormously, contributing 38% of the acid at Barnum. Acid discharge from Abrams Creek more than doubled between 1968-69 and 1973 as a result of surface mining. In 1973 average daily acid load in lbs/day was 72,000 from the North Branch at Barnum, 22,900 for Buffalo Creek, 15,000 for Abrams Creek, 10,500 for Stony River, and 8,000 for Piney Swamp Run. (Lynch-Wisconsin) W78-01959

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS. Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health. For primary bibliographic entry see Field 5A. W78-01962

CHEMICAL-PHYSICAL AND BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THE CUYAHOGA RIVER (1973-1974). Akron Univ., OH. Dept. of Biology. J. H. Olive. The Ohio Journal of Science, Vol. 76, No. 1, p 5-15, January 1976. 5 fig., 2 tab., 20 ref.

Descriptors: *Water quality, *Water pollution, Rivers, Tributaries, Pollutants, Ohio, Watersheds(Basins), Dissolved oxygen, Coliforms, Heavy metals, Nitrogen compounds, Water temperature, Water chemistry. Identifiers: *Cuyahoga River(OH).

Water quality of the Cuyahoga River in heavily populated and industrialized northeastern Ohio was monitored at seven sampling stations from October 1973 to September 1974, for dissolved oxygen, hydrogen ions (pH), ammonia-nitrogen, nitrate-nitrogen, total inorganic phosphate, filtrable residue, heavy metals, and water temperature. Biological measurements included fecal coliform bacteria density, and taxa and abundance of benthic macroinvertebrates. During this survey dissolved oxygen concentrations in all areas consistently exceeded 6 mg/l, well above minimum Ohio water quality standards. However, automatic DO monitors of the U.S. Geological Survey showed that during the summer of 1974 downstream of Akron DO often fell below 4 mg/l, and dropped as low as 2 mg/l. Such low concentrations even for short periods are undoubtedly harmful to aquatic life. Ammonia-nitrogen concentrations ranged from 0.1 mg/l upstream to 7.1 mg/l between Akron and Brecksville. Lead levels at Brecksville (0.1 mg/l) were unacceptably high. Fecal coliform bacteria density ranged from 130/100 ml at Hiram Rapids to over 10,000/100 ml below Akron. Whereas at Hiram Rapids 60% of benthic invertebrates were pollution-sensitive, between Akron and Independence over 90% were pollution-tolerant. Species diversity declined drastically from a high of 106 taxa at Hiram Rapids to 30 at Independence, with a low of 25 at Boston Mills. Most other indicators were generally at acceptable levels. (Lynch-Wisconsin) W78-01964

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE-REPRISE. San Diego State Univ., CA.

K. K. Bertine, and E. D. Goldberg. Environmental Science and Technology, Vol. 11, No. 3, p. 297-299, March 1977. 1 fig., 2 tab., 5 ref.

Descriptors: *Heavy metals, *Water pollution sources, *California, Banks, Metals, Cobalt, Cadmium, Lead, Chromium, Copper, Manganese, Nickel, Zinc, Iron, Aluminum, Pacific Ocean, Coasts, Littoral, *Sediments. Identifiers: *Anthropogenic input, *San Clemente Basin(Pacific Ocean), *Santa Catalina Basin(Pacific Ocean), Silver, Vanadium, Plutonium 23a, Plutonium 240, Lead 210.

Amounts and possible sources of heavy metal pollution in an outer basin 100 km off the southern California coast are determined and compared with those previously studied 30 km off the coast. Sediments currently studied were taken from a bank slope between the San Clemente and Santa Catalina basins along the nearshore. Lead, zinc, and vanadium are significantly enriched relative to aluminum in the uppermost 2 cm. Cadmium, manganese, and cobalt are higher in the first two levels, 0-0.5 and/or 0.5-1.0 cm, than at greater depths. Bioturbation may account for the Pu 239 and 240, and Pb 210 distributions. Pu 239 and 240 is found to a depth of about 10 cm, but with a sedimentation rate of 5 cm/1000 years, it should be found within the top 0.2 cm, representing the past 40 years. This 0.2 level indicates a time of about 1949, when anthropogenic input first became obvious in the inner basin sediments. Anthropogenic fluxes of zinc, vanadium, and lead from the coast

to the ocean, roughly fall off as a square of the distance from shore. Fluxes to the outer basin relative to the inner basin are less by a factor of about ten. This indicates that transport of these three metals may be mainly atmospheric. (Spaeth-Wisconsin) W78-01970

LAKE TAHOE GEOCHEMICAL STUDY. 1. LAKE CHEMISTRY AND TRITIUM MIXING STUDY. Scripps Institution of Oceanography, La Jolla, CA. For primary bibliographic entry see Field 5A. W78-01978

BUOYANT RECTANGULAR SURFACE THERMAL PLUMES. Old Dominion Univ., Norfolk, VA School of Engineering. J. M. Kuhlman, and J. M. Prah. Journal of Great Lakes Research, Vol. 2, No. 2, p 340-356, December 1976. 12 fig., 2 tab., 15 ref.

Descriptors: *Thermal pollution, *Powerplants, *Model studies, Thermal powerplants, Nuclear powerplants, Electric powerplants, Heat flow, Heat transfer, Circulation, Water circulation, Flow, Temperature, Water temperature, Water pollution. Identifiers: *Thermal plumes.

A near-field integral model of a buoyant surface thermal plume entering a crossflow was developed which includes the effects of buoyancy through the empirical assumption that the slope of the plume thermocline is proportional to the local plume depth times the local plume excess temperature and inversely proportional to the initial plume internal Froude number. The model was compared with the laboratory data and field data. Data generally agreed well with the model using single values of the empirical constants in the theory, varying only the initial internal Froude number and the crossflow-to-initial-plume-velocity ratio, to match the data values. Matching was achieved for distances along the plume center line of approximately 20 initial plume widths for the laboratory data and 50 widths for the field data. (Sims-ISWS) W78-01986

CURRENTS AND CONTAMINANT DISPERSION IN THE NEARSHORE REGION AND MODIFICATION BY A JETPORT. Case Western Reserve Univ., Cleveland, OH Dept. of Earth Sciences. Y. P. Sheng, and W. J. Lick. Journal of Great Lakes Research, Vol. 2, No. 2, p 402-414, December 1976. 12 fig., 7 ref.

Descriptors: *Dispersion, *Lake Erie, *Diffusion, *Wastes, Currents(Water), Islands, Shores, Water quality, Lakes, Winds. Identifiers: *Jetports, Wind-driven currents.

The steady-state and the time-dependent, constant density, wind-driven currents in the nearshore Cleveland area of Lake Erie, under present conditions and as modified by the proposed Lake Erie International Jetport, were calculated numerically. Two specific jetport configurations were studied in detail: (1) an island, and (2) an island with causeway to shore. Coupling procedures between the fine nearshore numerical grid and the coarse overall-lake grid were studied in detail and were presented in this paper. For the above jetport configuration, several computations illustrating the dispersion of a contaminant from a point source (the Cuyahoga River) into Lake Erie were made. For the particular cases studied, it was shown that the island does not significantly modify the currents or contaminant dispersion while the island with a causeway to shore does. The nearshore numerical models presented here can be modified

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Sources Of Pollution—Group 5B

easily to study the nearshore dispersion in other large lakes. (Lee-ISWS)
W78-01989

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
W. W. Whitlock, Jr.
Ground Water, Vol. 15, No. 6, p. 416-419,
November-December 1977. 2 fig, 4 ref.

Descriptors: *Groundwater, *Water quality, *Nitrates, *Maryland, Wells, Water wells, Farms, Farm wastes, Land use, Urbanization, Suburban areas, Nitrogen, Sampling, On-site data collections, Water chemistry, Hazards, Public health, Pollutants, Water pollution.
Identifiers: Farmland subdividing.

Changing land-use patterns are occurring in all areas of the United States, especially those surrounding urban centers. Previously farmed land is being converted to residential subdivisions of 1/4 to 1/2 acre lots with on-site water supply and sewage disposal systems (well and septic). This in itself can also hazards resulting from the original uses of the land that have not been anticipated. This paper was concerned with the high nitrate nitrogen levels in groundwater resulting from long-term farming. Natural chemicals and biological activity will break down manure to persistent nitrate that is then leached into the water table. Subsequent subdivision of the land, well installation, and consumption of the contaminated groundwater constitute a problem that has been recognized medically since 1945, but not by the drilling industry or environmental health personnel. Regulations of the Maryland State Department of Health and Mental Hygiene provide for a required series of bacteriological and chemical samples prior to the water supply being put into service. To date, the tests usually are conducted after occupancy, if at all. In Harford County, Maryland, at least 4 subdivisions have been shown to have areas of excessive nitrate nitrogen (up to 60 ppm) showing the need for stringent enforcement of existing regulations. (Sims-ISWS)
W78-01993

PLUTONIUM AND AMERICIUM: UPTAKE FROM CONTAMINATED SEDIMENTS BY THE POLYCHAETE NEREIS DIVERSICOLOR,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W78-02003

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, CLAIRTON WORKS, PITTSBURGH, PENNSYLVANIA, JANUARY 28-31, 1976.

National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 586.
Price codes: A07 in paper copy, A01 in microfiche.
Report No. EPA-330/2-76/025, May 1976. 138 p, 4 fig, 11 tab, 5 ref, 4 append.

Descriptors: *Monitoring, *Sampling, *Water analyses, *Water pollution sources, *Outlets, Water quality, Path of pollutants, Water sampling, On-site data collections, Reliability, Industrial wastes, *Waste water disposal, Clairton(PA), Steel mills.

The Clairton, Pennsylvania, works of the United States Steel Corporation include a coke plant, chemical plant, and steel plant. Since the facility is on the Monongahela River approximately 18 miles above the confluence of the Ohio, Monongahela, and Allegheny Rivers, a waste water monitoring survey was conducted for waste water discharged daily through 10 outfalls into the Monongahela River and for nine outfalls which discharge into

Peters Creek, a tributary of the Monongahela. The National Enforcement Investigations Center also conducted a dye study at four of the outfalls on December 15-18, 1975, to assess whether the United States Steel Corporation sampling locations were representative of the total waste water flow discharged from the Clairton works. Results of an in-plant monitoring survey conducted on January 28-31, 1976, are presented. (Schulz-FIRL)
W78-02020

MEETING THE GROUNDWATER CONTAMINATION PROBLEM,
Robert S. Kerr Environmental Research Lab., Ada, OK.

J. W. Keeley.
Water and Sewage Works, Vol. 124, No. 11, p. 88-90, November, 1977. 1 fig, 2 tab, 12 ref.

Descriptors: *Water pollution control, *Groundwater, *Subsurface waters, Industrial wastes, Municipal wastes, Leachates, Brines, Nitrates, Chlorides, Waste water disposal.

Five geographical areas in the United States were covered in studies conducted by the EPA to establish priorities in potential groundwater contamination sources. Areas examined were the northwest, southwest, south central, southeast, and northeast sections of the country. Sources of groundwater pollution are listed according to severity for all five regions. Chloride, nitrates, heavy metals, and hydrocarbons were the four most common pollutants encountered in the study. Individual sewage disposal systems which can contribute nitrates, chlorides and coliform are reported as adding approximately 3.5 billion gal of waste to the subsurface environment daily. Groundwater pollution from the petroleum industry results from brines recovered with crude oil, which are reinjected for disposal or for repressurization of an oil horizon for secondary recovery projects. Leachates from landfills and surface waste impoundments are cited as additional groundwater pollution sources which have not yet been fully defined. Salts, fertilizers, pesticides from agricultural sources, and highway deicing salts are discussed as potential groundwater pollutants. Faulty water well construction also contributes to groundwater pollution. The economic consequences of groundwater pollution are discussed. (Schulz-FIRL)
W78-02031

STREAM ASSIMILATION CAPACITY: A FACTOR IN TRACE ORGANIC WASTEWATER TREATMENT POLICY,
Alabama Univ., University.
G. C. April, and S. Ng.
AIChE Symposium Series, Vol. 73, No. 166, p. 364-379, 1977. 9 fig, 3 tab, 15 ref.

Descriptors: *Phenols, *Water quality, *Waste assimilative capacity, *Self-purification, Surface waters, Mathematical models, Chemical wastes, Aromatic compounds, Odor, Taste, Hydrologic data, Industrial wastes, Waste water treatment.

Since decisions in trace organic waste water treatment policy often ignore the self-purification properties of receiving streams, the stream assimilation capacity of receiving waters for phenolic chemicals is discussed. Various elements which may influence an assessment of the stream impact of treated waste discharge are discussed, including a knowledge of the technical, political, and historical details of the system; identification of the users, locations, quantity, and characteristics of each discharge along a water course; hydrographic and hydrologic data; and water quality data. Specific aspects of phenolic chemicals are discussed, including taste and odor objections, toxicity to aquatic species, BOD, and COD. Various mechanisms and reactions in the transport and fate of phenol in a stream are examined with respect to the nature of self-purification. A basic

material balance equation for phenolic chemicals in a fresh water stream is presented. Previous data on stream quality were used to determine the rate constant for phenol depletion. Methods used to calibrate and verify the material balance equations for phenolic chemicals within the creek included an estimation of phenolic chemical depletion coefficients; the comparison of trends indicated by the coefficients with hydrologic and biologic activity noted in the surveys; and the direct comparison of the model and survey phenolic chemical profiles in the creek. The application of the model equations to assess the effects of plant loads and low flow is discussed with respect to creek quality. (Schulz-FIRL)
W78-02035

INDUSTRIAL DUMPS THREATEN GROUNDWATER.
Engineering News-Record, Vol. 199, No. 4, p. 69, October, 1977.

Descriptors: *Water pollution sources, *Groundwater, *Leaching, *Path of pollutants, *Landfills, Metals, Hydrogeology, *Waste disposal, Industrial wastes.

A seven-month study conducted by Garaghty and Miller, Inc., of Port Washington, New York, for the EPA has revealed that land disposal sites which receive a large proportion of industrial wastes may present a source of groundwater pollution. Migration of hazardous substances into subsurface water supplies was observed at 43 of the 50 disposal sites in the survey. Selenium, barium, cyanide, copper, and nickel were identified as the most frequently observed inorganic contaminants while PCB's organic solvents, and benzene and its derivatives were designated as the most common organic pollutants. Levels in drinking water obtained near 26 of the disposal sites were higher than federal regulations allow for selenium, arsenic, chromium, and lead. The 50 sites, which are located in 11 states east of the Mississippi River, were chosen from 122 disposal sites visited by Garaghty and Miller. Although approximately 50% of the selected sites already used monitoring wells and 9% of the sites were equipped with groundwater protection systems, none of the facilities monitored with the path of organic chemicals. (Schulz-FIRL)
W78-02043

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA),
A. Horvath.
Gépgyártastechnologia, Vol. 17, No. 4, p. 150-154, April, 1977. 9 tab.

Descriptors: *Sludge disposal, *Soil-water-plant relationships, *Leaching, *Path of pollutants, Heavy metals, Waste water disposal, Landfills, Industrial wastes.

Recommendations on the basis of laboratory leaching tests with sand are given for the disposal in temporary landfills of sludges generated by electroplating shops. The experiments investigated the leaching of toxic components, especially cyanides, cadmium, and nickel. The findings indicate that such sludges can be disposed of on soil surfaces only on an interim basis, after laboratory leaching tests. There must be a ground layer with a minimal thickness above the highest groundwater level. Disposal sites larger than 20 sq m should be sealed if the thickness of the sludge layer to be deposited, is to exceed 50 cm. The groundwater quality should be monitored at various distances from the disposal site. Sludge mixed with concrete in concrete blocks was found to present practically no groundwater contamination hazard. (Takacs-FIRL)
W78-02056

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

PHOTODECOMPOSITION OF ODOROUS CHLOROPHENOLS IN WATER, National Inst. for Environmental Studies, Tsukuba (Japan). Dept. of Chemistry and Physics. For primary bibliographic entry see Field 5D. W78-02068

THE DRIFT OF ORGANISMS IN FLOWING WATER, (IN FRENCH), Lyon-1 Univ., Villeurbanne (France). Dept. de Biologie Animale et Zoologie. M. Bournaud, and M. Thibault. Ann Hydrobiol. 4(1), p 11-49, 1973.

Descriptors: *Drifting(Aquatic), Aquatic insects, Diatoms, *Diptera, *Ephemeroptera, Gammarid, Hydracarina, Invertebrates, Linnephilidae, *Plecoptera, Microorganisms.

Information obtained from about 10 yr work on drift (the aggregate of organisms and debris carried downstream by the current) is summarized. Samples were taken either with a net placed at a fixed point in the stream (net mouth 300-1800 cm², length 0.75-2.50 m, mesh width 0.1-1 mm) to catch all the drift, or by means of a sieve or net placed in a waterfall and sometimes provided with a recording apparatus which turns on a 24 h cycle. The unit of measure, which is most convenient and most suitable for comparisons between stations, is the number of individuals drifting through a section of 1 m² during 1 h, or what is called the intensity of drift. The weight or volume of organisms is also utilized. In addition to mineral and organic particles (plant debris dead bodies and exuviae of animals) carried along by the current, the drift is composed of living organisms, either of terrestrial origin (exogenous) or of aquatic origin (emerging imagines of insects and all benthic invertebrates). All the aquatic groups are involved, but the most abundant are usually gammarids and larvae of Ephemeroptera, Plecoptera and Diptera. Most of the animal groups involved in the drift have a nocturnal maximum, either at the beginning of the night (bigemini type) or at the end of the night (alternans type). On the other hand, several groups (Diatoms, Hydracarina, some Linnephilidae) are diurnal. It was shown experimentally that there is a parallel rhythm of locomotory activity in the case of larvae of Ephemeroptera and Trichoptera, and the maximum activity is also nocturnal, corresponding to the period of feeding. The standardization of techniques and experimentation would make it possible to determine the mechanisms of drift.—Copyright 1975, Biological Abstracts, Inc. W78-02103

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, AND MANGANESE CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA, (IN JAPANESE), Okayama Univ. (Japan). Inst. of Agricultural and Biological Science. J. Kobayashi, J. Mori, S. Muramoto, S. Nakashima, and H. Teraoka. Jpn J Limnol 36(1), p 6-15, 1975.

Descriptors: Trace elements, Arsenic, Biwa, Cadmium, Copper, *Distribution, *Japan(Lake Biwa), Lead, Manganese, Sediments, Spectrophotometry, Zinc, *Metals, Lake sediments.

To investigate the vertical and horizontal distribution of trace metals in the sediment of Lake Biwa (Japan), 51 samples were collected and analyzed for As, Cd, Pb, Zn, Cu and Mn by atomic absorption spectrophotometry. Of these samples, 14 were taken from various points on the surface of the bottom sediment and 37 were taken at intervals of about every 5 m from a vertical core to a depth of 200 m below the lake bottom. The vertical distribution of the metals in the core was, on a dry matter basis, as follows: As 9-58 ppm (average 24 ppm), Cd 0.24-1.36 ppm (0.44 ppm), Pb 18-34 ppm (27 ppm), Zn 98-160 ppm (133 ppm), Cu 34-66 ppm

(52 ppm), and Mn 620-5300 ppm (1800 ppm). The highest values of both Mn and Cd were found in the same sample from 130 m, and some significant environmental changes took place during the period in which it was deposited, roughly 300,000 yr ago. For other samples the content of trace metals did not differ much with depth although the materials from the core were probably deposited during the past several hundred thousand years. A remarkable accumulation of As (126-450 ppm) and Mn (8300-17,300 ppm) was observed at several points near the center of the northern part of the main lake basin, where pollution was not expected. In the southern part of the lake, the surface sediment near the Seta River which flows out of the lake was polluted by Cd and other metals (Cd 26 ppm, Pb 259 ppm, Zn 736 ppm). At other points the content of trace metals in the surface sediment was similar to that of the verticle core samples from below the level polluted by man. The high concentration of trace metals detected in the surface sediment at some points indicated that the natural process of accumulation of trace metals throughout the past several hundred thousand years have been broken by recent human activity.—Copyright 1975, Biological Abstracts, Inc. W78-02151

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER, Waterloopkundig Lab., Delft (Netherlands). For primary bibliographic entry see Field 5C. W78-02183

WATER QUALITY OF IMPOUNDMENTS ON SURFACE-MINED SITES, For primary bibliographic entry see Field 5A. W78-02189

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY, For primary bibliographic entry see Field 4A. W78-02190

OXYGEN UTILIZATION IN SOILS FLOODED WITH SEWAGE WATER, Agricultural Research Service, Phoenix, AZ. Water Conservation Lab. J. C. Lance, F. D. Whisler, and H. Bouwer. J Environ Qual. 2(3), p 345-350, 1973.

Descriptors: *Denitrification, *Diffusion, *Flooded soils, Flow, Mass flow, *Nitrification, Oxygen transport, Sewage effluents, Soils, Water pollution, *Path of pollutants.

Diffusion and mass flow were important mechanisms of O₂ transport in soil columns intermittently flooded with sewage water. The amount of O₂ entering the soil by mass flow during drainage was 30-40% of the total amount entering the soil. Most of the estimated available O₂ was used in the oxidation of NH₄⁺ to NO₃⁻. Enough O₂ entered the soil during a 5-day dry period to oxidize all of the N applied when the soil was flooded for 6 days with secondary sewage effluent containing 20 mg/l of NH₄-N at an infiltration rate of 50 cm/day. Application of NH₄⁺ in excess of that which could be oxidized during the dry period resulted in a gradual increase in the NH₄⁺ concentration of the reclaimed water. An increase in NH₄⁺ concentration can be prevented by balancing the NH₄-N applied against the O₂ entered during the dry period. Most of the O₂ entered the columns during the 1st 3-4 days of the dry period. Thus the amount of O₂ entering the soil can be increased more effectively by increasing the frequency rather than the length of the dry periods. The soil profile remained in a reduced state below the 140-cm depth during a 10-day dry period. This showed that NH₄⁺ stored below this depth would not be nitrified and that an environment favorable for denitrification was maintained in part of the profile at all times. Anaerobic reac-

tions were as effective as aerobic reactions in reducing the chemical oxygen demand (COD) of sewage water from 50 to 18 mg/l.—Copyright 1974, Biological Abstracts, Inc. W78-02194

EFFECT OF SUSPENDED PARTICLES AND THEIR SIZES ON NITRIFICATION IN SURFACE WATER, Pahlavi Univ., Shiraz (Iran). B. Kholdebarin, and J. J. Oertli. Journal Water Pollution Control Federation, Vol. 49, No. 7, p. 1693-1697, July 1977. 2 fig, 2 tab, 19 ref.

Descriptors: *Nitrification, *California, *Oxidation, *Surface waters, *Particle size, Ammonium compounds, *Suspended particles, *Whitewater River(CA).

Results of studies with water samples from the Whitewater River in Southern California clearly indicate the importance of the presence of suspended particulates and of particle size in nitrifying bacteria in surface water. While organisms can function well in media lacking measurable suspended solid materials, their activities will be enhanced as the amount of particulates increases in the solutions; the stimulating effect of particles is largely caused by their acting as a physical support for the proliferation of the nitrifying bacteria, rather than as base exchange sites for the substrates used in nitrification processes. Also, it appears particles as large or larger than the organism are most efficient in stimulating the nitrification process, contradicting findings of earlier studies which concludes that particles with diameters in excess of 0.7 microns are not essential for rapid biological nitrification in aquatic systems. (Coyle-Wisconsin) W78-02200

5C. Effects Of Pollution

ON THE BIOLOGY OF THE CLADOCERAN HOLOPEIDIUM GIBBERUM ZADDACH IN WINDGFAELLWEIHER (BLACK FOREST) (IN GERMAN), Freiburg Univ. (West Germany). Limnologisches Inst. For primary bibliographic entry see Field 2H. W78-01703

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE, Sylvester Underseas Inspection, Rockland, MA. J. D. Eger. Rhode Island University Marine Affairs Journal, No 4, October 1976. 18 p, 38 ref.

Descriptors: *Mining, *Environmental effects, *Baseline studies, Resources development, Economics, Legislation, *New England, Sands, Gravels, *Outer Continental Shelf, *Offshore mining.

Offshore mining will undoubtedly cause environmental changes in the immediate area of the mining site, and changes in a larger surrounding area may occur. Direct effects of marine mining on the environment include removal of substrate, introduction of fines into the water column, possible introduction of organics, toxins, and metals into the water column, possible burial of adjacent benthic organisms, possible alteration of bottom current patterns, and possible alteration of fish spawning patterns due to substrate removal. The presence of an offshore hard minerals mining operation may involve multiple use conflicts which would have to be resolved before mining could commence. As the offshore mining industry matures, the scope of mining operations on the continental margin will greatly increase. There-

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fore, the management capabilities of the Conservation Division of the U.S. Geological Survey, which manages mining operations in this area, will have to be expanded. Factors other than pure market considerations, such as environmental concerns and jurisdictional-management problems, will have a large part in determining whether or not the sand and gravel industry will move offshore in New England. (Sinha-OEIS)
W78-01714

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 29-39, 5 fig, 38 ref.

Descriptors: *Estuaries, *Ecosystems, *Water pollution effects, Baseline studies, Environmental effects, Model studies, Energy flow.

An estuary is a complex ecosystem which is subjected to a wide range of environmental fluctuation in 'normal' parameters, such as salinity, temperature, and rhythmic tidal action. In today's world more and more estuaries are being assaulted by man-induced factors. Many factors make estuaries an important biological and economic resource, but perhaps the most important of all is the amount of energy in these systems. In order for man to manage this habitat for the greatest benefit to man and the earth's ecosystem, a thorough understanding of the energy budget of estuaries is vital. Comparative models must be developed for characteristic types of estuaries to assess their essential common and distinctive features. This will enhance the ability of man to predict the effects of a proposed environmental change in other estuaries without the need for excessively costly environmental impact investigations. (Sinha-OEIS)
W78-01766

IMPACT OF ESTUARINE POLLUTION ON BIRDS.

Fish and Wildlife Service, Laurel, MD.
L. J. Blus, S. N. Wiemeyer, J. A. Kerwin, R. C. Stendell, and H. M. Ohlendorf.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 57-71, 12 fig, 3 tab, 62 ref.

Descriptors: *Estuaries, *Birds, *Water pollution effects, *Environmental effects, *Heavy metals, Mercury, Lead, Oil pollution, Mortality.

Pollution of estuaries affects birds directly, through chemical toxication, which may result in outright mortality or in reproductive impairment. Lead from industrial sources and roadways enters the estuaries and is accumulated in tissues of birds. Lead pellets deposited in estuaries as a result of hunting are consumed by ducks with sufficient frequency to result in large annual die-offs from lead poisoning. Fish in certain areas, usually near industrial sources, may contain levels of mercury high enough to be hazardous to birds that consume them. Other heavy metals are present in estuarine birds, but their significance is poorly known. Oil exerts lethal or sublethal effects on birds by oiling their feathers, oiling eggs and young by contaminated parents, and by ingestion of oil-

contaminated food. Organochlorine chemicals, of both agricultural and industrial origin, travel through the food chains and reach harmful levels in susceptible species of birds in certain estuarine ecosystems. Both outright mortality and reproductive impairment have occurred. (Sinha-OEIS)
W78-01768

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY.

Mann (Roy) Associates, Inc., Cambridge, MA.
R. Mann.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 73-82, 1 fig, 5 ref.

Descriptors: *Estuaries, *Land use, *Water quality, *Aesthetics, Environmental effects, Resource development, Baseline studies.

Although advances in identification and management of aesthetic resources have been made possible through recent legislation and administrative guidelines dealing with the estuarine environment, new measures are needed if significant impacts on aesthetic resources and resulting effects on water quality are to be avoided. This paper recommends the adoption of expanded review responsibilities and standards on the part of federal and state agencies, and the creation of new funding elements to achieve improved estuarine aesthetic resource protection and management. (Sinha-OEIS)
W78-01769

FISH PRODUCTIVITY OF VOLGA RESERVOIRS AND WAYS TO INCREASE IT UNDER COMPLEX UTILIZATION OF WATER RESOURCES, (IN RUSSIAN).

A. S. Konstantinov, G. V. Nikol'skii, A. G. Poddubnyi, V. I. Romanenko, and N. S. Stroganov.
Vopr Ikhtiol 16(2), p 233-246, 1976.

Descriptors: *Fish productivity, *Energy, *Eutrophication, Fish, Pollution, *Primary productivity, Reservoirs, Salmon, Sturgeon, USSR (Volga Reservoirs), Water pollution effects.

Productivity and clean water are viewed as conjugated functions of the same ecosystem. Levels of primary and secondary productivity production of Volga reservoirs (USSR) and natural fish breeding and fish production particularly for species such as sturgeon and salmon) are reviewed. Interaction of pollution, eutrophication and heat energy development is discussed.—Copyright 1977, Biological Abstracts, Inc.
W78-01777

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS.

Ecological Analysts, Inc., Baltimore, MD.
L. D. Jensen.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 359-372, 35 ref.

Descriptors: *Estuaries, *Thermal pollution, *Water pollution effects, Cooling water, Thermal stress, Aquatic life, Ecosystems.

A descriptive summary of both thermal and nonthermal power plant effects is presented with an attempt to provide an insight into the total ecological impact of power generating stations operating in estuarine systems. Specific effects of thermal and other plant associated stresses are summarized for aquatic organisms exposed to a range of time and temperature exposures resulting from once-through cooling systems. This review presents specific summaries of representative case histories of thermal effects in east coast, gulf coast, and west coast estuarine systems with an attempt to identify regional characteristics that may influence the response of aquatic populations to thermal effluents. (Sinha-OEIS)
W78-01790

OIL POLLUTION IN THE COASTAL ENVIRONMENT.

Woods Hole Oceanographic Institution, MA.
J. W. Farrington.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 385-400, 3 fig, 2 tab, 56 ref.

Descriptors: *Estuaries, *Oil spills, *Oil pollution, *Water pollution effects, Baseline studies, Biodegradation, Ecosystems, Aquatic life, *Outer Continental Shelf, *Coastal zone, Biological effects.

Petroleum and petroleum products such as fuel oil and lubricating oil are very complex mixtures of chemicals with individual compounds numbering at least in the tens of thousands. This very complex chemical mixture is introduced into the already complex system of interacting physical, chemical, biological, and geological components which constitute the marine environment. Thus, the investigation of the impact of oil pollution on the marine environment is a difficult undertaking which will require much more research before some of the potentially most serious problems are fully understood. (Sinha-OEIS)
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO.

Mississippi State Univ., Mississippi State.
L. R. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 401-408, 50 ref.

Descriptors: *Estuaries, *Oil pollution, *Water pollution effects, *Gulf of Mexico, Environmental effects, Toxicants, Ecosystems, Aquatic life, *Outer Continental Shelf, Coastal zone management, Environmental factors, Carcinogens.

The purpose of this report is to comment on the usefulness of available information on oil pollution from a standpoint of estuarine management; highlight some of the developing areas of concern; and make concrete recommendations concerning future research needs. (Sinha-OEIS)
W78-01793

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS.

Mote Marine Lab., Sarasota, FL.; and Ecological Analysts, Inc., Sarasota, FL.
J. L. Lincer.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 425-443, 5 tab, 133 ref, 3 append.

Descriptors: *Estuaries, *Ecosystems, *Pesticides, *Water pollution effects, *Organic compounds, Toxins, Polychlorinated biphenyls, DDT, Biological effects, Synthetic organics, Hexachlorobenzene, Phthalate esters.

The presence and effects of synthetic organic compounds is briefly reviewed with reference to the recent literature on the estuarine ecosystem. Pesticides and industrial toxicants are discussed in general with some attention given to synergistic and modifying effects. Recommendations for future research are made which include elucidating the effects of synthetic organics at the ecosystem level. (Sinha-OEIS) W78-01796

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-01798

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-01800

THE CRUCIAL ROLE OF SYSTEMATICS IN ASSESSING POLLUTION EFFECTS ON THE BIOLOGICAL UTILIZATION OF ESTUARIES,
Delaware Univ., Lewes.
M. R. Carriger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proc of a Conf held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No 440/1-77-007B, Mar 1977. Vol 2, p 487-506, 2 tab 101 ref. Also as: Del Univ, Coll of Marine Studies Contribution No 103.

Descriptors: *Water pollution effects, *Systematics, *Estuarine environment, Ecosystems, Coasts, *Biological effects, Environmental impact.

The data of systematics form the essential foundation for pollutional biology. Living targets of pollution must be identified precisely; imprecision nullifies results and renders them nonreplicable. Most estuarine and coastal marine plant and animal groups are poorly known systematically. Major bottlenecks in the application of systematics to the problems of environmental pollution result from the critical shortage of experienced systematic specialists and technicians, as well as lack of inventories of specialists, identification publications, and identification services. Although water quality legislation implies the need for identification of organisms involved in analyses of the biological impacts of pollutants, there has been no conspicuous financial support for systematic work. Because basic and applied environmental research and its application to the practical problems of pollution have grown far more rapidly than the supporting base of systematic biology, it

is imperative that existing human and material systematic resources be conserved, and their further development be encouraged. Specific recommendations are offered to maximize the service role of biological systematics in the identification and assessment of the effects of pollution on the biological utilization of estuaries and coastal waters in the United States. (Sinha-OEIS) W78-01801

BACTERIA AND VIRUSES—INDICATORS OF UNNATURAL ENVIRONMENTAL CHANGE OCCURRING IN THE NATION'S ESTUARIES,
Maryland Univ., College Park.
R. R. Colwell.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 507-518, 77 ref.

Descriptors: *Estuarine environment, *Bacteria, *Viruses, *Bioindicators, Microorganisms, Water pollution effects, Ecosystems, Biological effects.

Microorganisms are useful indicators of alterations in the natural environment. As presently employed, however, 'indicator organisms' such as fecal coliforms and total coliforms have severe limitations. Other organisms have been proposed in recent years as potential indicator organisms, viz., stercococci, clostridia, and pseudomonads. The indicator organism concept is reviewed and recommendations for future studies are made. In particular, detection, isolation, and identification of viruses, effects of pollutants on the natural microbial flora, and reevaluation of microbial indicators are critical areas requiring research. (Sinha-OEIS) W78-01802

A BRIEF ASSESSMENT OF ESTUARY MODELING—RECENT DEVELOPMENTS AND FUTURE TRENDS,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 2L.
W78-01804

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
L. E. Cronin.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 739-756, 2 fig, 4 tab, 54 ref, 2 append.

Descriptors: *Estuaries, *Estuarine environment, *Pollutant identification, *Water pollution effects, *Environmental effects, Ecosystems, Ecology, Water resources, *Outer Continental Shelf, Coastal zone.

Twelve principal uses are made of estuaries, providing exceptional value of human interests. In the United States every one of these uses is expected to increase in the next 20 years above its present high level. At present, at least 16 major classes of pollutants are placed in estuaries, with effects that range from minor inconvenience to serious reduction in the usefulness of the system for other purposes. Some present pollutants have high potential for beneficial introduction if the quantity, site, and characteristics of the material are appropriate. In this overview, the uses and pollutants are identified, the trend for each is noted, the principal deleterious effects of pollutants in coastal waters are summarized, and visual summa-

ries are presented to suggest which of the uses may be affected by each class of pollutant. (Sinha-OEIS) W78-01820

KEY TO THE CHAROPHYTES OF SOUTH AFRICA,
Rhode Island Univ., Kingston. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W78-01825

PHYTOPLANKTON PRODUCTION IN LANGEBAAN LAGOON AND SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
For primary bibliographic entry see Field 2L.
W78-01837

THE ALGAL FLORA OF SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
For primary bibliographic entry see Field 2L.
W78-01840

STUDIES ON THE SOUTH AFRICAN STRAIN OF SCHISTOSOMA MANSONI - PART 3: NOTES ON CERTAIN HOST-PARASITE RELATIONSHIPS BETWEEN INTRA-MOLLUSCAN LARVAE AND INTERMEDIATE HOST,
Bilharzia Field Research Unit, Nelspruit (South Africa).
C. H. J. Schutte.
South African Journal of Science, Vol 71, p 8-20, January 1975. 40 ref.

Descriptors: Feeding habits, Longevity, Intermediate hosts, Animal growth, Mortality, Animal survival, Sporocysts, Bilharzia, *Host-parasite relationships, Human parasites, Cercariae, *Mollusks, Larvae, *Snails, Biomphalaria, *Schistosoma mansoni, *South Africa.

Host-parasite relationships between freshwater snails and Schistosoma spp., relating to growth, mortality and survival, longevity, oviposition and food-consumption of snails, are reported for the South African strain of S. mansoni and the snail B. salinarum. Materials and methods were the same as those used in conjunction with a study on the intra-molluscan larval stages. (Part 2.) Cercarial counts were made according to the method described by Pitchford et al (1969). (So African Water Info Center) W78-01847

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA.
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 10C.
W78-01852

EFFECTS AND PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ.-Madison. Water Chemistry Program.
D. J. Holmberg, and F. G. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2738-2746, December 1976. 5 fig, 2 tab, 17 ref. EPA T-900114.

Descriptors: *Herbicides, *Water pollution effects, *Pesticide toxicity, Water pollution sources, Chlorophyll, Dissolved oxygen, Chara, Fish, Sunfishes, Degradation(Decomposition), Persistence, Aquatic weed control, Wisconsin, Ponds, *Endothall, Aquathol K, Myriophyllum spicatum, Water milfoil, Coontail, Ceratophyllum demersum, Elodea canadensis, Lepomis macrochirus.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

Treatment of a pond with the herbicide endothall killed all aquatic plants except Chara; after a slow 12-day degradation period, the herbicide rapidly broke down, reaching the 0.1 mg/l level of detection in 18 days. Two ponds at the Delafield Station of the Wisconsin Department of Natural Resources were used. Both ponds, created about 65 years ago with an average depth of 1 m, were drawn down in October 1972 and refilled in early spring 1973. Plant life in the 0.32 ha treatment pond at the time of the experiment consisted of 80% water milfoil (*Myriophyllum spicatum*), with the remainder composed of Chara spp., coontail (*Ceratophyllum demersum*), Elodea canadensis, flat-stemmed pondweed (*Potamogeton zosterifolius*), and sago pondweed (*P. pectinatus*). The control pond (0.43 ha) contained 90% Chara and 10% sago pondweed. The ponds were stocked with bluegills (*Lepomis macrochirus*) soon after refilling. The 0.32 ha pond was treated with the dipotassium endothall formulation Aquathol K on May 31, 1973 at the maximum recommended dosage of 5 mg/l. Various water quality parameters were monitored from May 17 to the end of June. By June 9 the pondweed, coontail, and most of the water milfoil were down. The elodea eventually all but disappeared, and the whole pond was taken over by Chara. No fish mortalities were detected. A decrease in chlorophyll content was observed, and dissolved oxygen dropped to below saturation; there was no serious oxygen depletion, however. (Lynch-Wisconsin)

W78-01906

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS, Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W78-01907

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING, Lamont-Doherty Geological Observatory, Palisades, NY. For primary bibliographic entry see Field 6G. W78-01908

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE, North Dakota Univ., Grand Forks. Dept. of Biology. D. F. Brakke. Hydrobiologia, Vol. 52, No. 2-3, p 159-163, 1977. 1 fig, 3 tab, 21 ref.

Descriptors: *Fallout, *Rainfall, *Chemistry of precipitation, Lakes, Phosphorus, Nitrogen, Ammonia, Nitrates, Hydrogen ion concentration, Trophic level, Precipitation (Atmospheric), Minnesota, *Wind-borne loading, *Lake Sallie (MN).

Rainwater was collected near the shores of eutrophic Lake Sallie, Minnesota and chemically analyzed in efforts to describe the magnitude of wind-borne loading of nitrogen to the lake. Rainwater pH ranged from 3.10 to 7.25, with values commonly below 4.50. Despite low pH, it contained less than 2 micrograms/l sulfate, was soft (20 micrograms/l calcium carbonate alkalinity), and had insignificant effects on the pH of well-buffered lake water. The range of total phosphorus was 0.250 micrograms/l, and the soluble reactive phosphorus range was 0.200 micrograms/l. Both were usually less than 40 micrograms/l, and often declined with continuing precipitation. The likely source of the loading is dust contamination from the fertile plains area to the west. Phosphorus inputs reached a maximum of 18.5 kg per rainfall. Ammonia was usually greater than nitrate-nitrogen. Ammonia/nitrate ratios varied from 0.3 to 10.0, and were usually 2.0 to 6.5. The range of ammonia was 100-2600 micrograms/l and nitrate 26-2060 micrograms/l. Washouts of ammonia nitrogen, and nitrate-nitrogen, followed by an in-

crease, could be detected within a single rainfall. On many occasions, increase in primary production occurred following rainfall. (Spaeth-Wisconsin)

W78-01909

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY, Texas A and M Univ., Galveston. Dept. of Marine Sciences. For primary bibliographic entry see Field 5A. W78-01911

A NEW TYPE OF THIOSULPHATE OXIDIZING, NITRATE REDUCING MICROORGANISM: THE OMICROSPIRA DENITRIFICANS SP. NOV., Nederlands Inst. voor Onderzoek der Zee, Texel. A. Timmer-Ten Hoor. Netherlands Journal of Sea Research, Vol. 9, No. 3-4, p. 344-350, December 1975. 2 fig, 8 ref.

Descriptors: *Denitrification, Microorganisms, Anaerobic conditions, Tidal marshes, Mud, *Thiomicrospira denitrificans, *Thiosulphate oxidation, Thiobacillus denitrificans, Netherlands.

Thiomicrospira denitrificans, a new species of thiosulphate-oxidizing, nitrate-reducing microorganisms, was isolated from a mixture of brown and black mud from tidal flats of the Dutch Wadden Sea in an anaerobic chemostat enrichment culture. The isolation of thiomicrospira was a byproduct of an effort to obtain a culture of Thiobacillus denitrificans. Thiomicrospira denitrificans is spiral-shaped, brown-colored in colonies, not motile, and is variable in length. Cells are 0.3 microns thick. It appears to be an obligate anaerobe, as well as an obligate denitrifier; this latter fact is peculiar since previously isolated nitrate-reducing organisms are normally regarded as facultatively aerobic. Although the microorganism has been isolated only once so far, future isolations should be relatively easy, as long as care is taken to ensure the complete removal of oxygen from the enrichment culture. (Lynch-Wisconsin)

W78-01912

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT, California Univ., San Diego, La Jolla. Inst. of Marine Resources. W. G. Harrison, R. W. Eppley, and E. H. Renger. Bulletin of Marine Science, Vol. 27, No. 1, p. 44-57, 1977. 6 fig, 9 tab, 37 ref. NSF GX-42579.

Descriptors: *Copper, *Nitrogen, *Phytoplankton, Nitrate, Ammonium compounds, Metabolism, Nutrients, Toxicity, Eutrophication, Ecosystems, Pollutants, Water pollution, Carbon, Radioisotopes, *Canada, Research equipment, Testing procedures, *Nitrogen budgets, *Nitrogen metabolism, CEPEX program, Controlled Experimental Ecosystem, *Saanich Inlet (Canada).

The effects of pollutants of assimilation of nitrogen by phytoplankton were studied in three experiments of the CEPEX program, in which water columns were entrapped in 0.25-scale Controlled Experimental Ecosystem enclosures (CEEs) at Saanich Inlet, B. C., Canada. Assimilation rates were measured isotopically with ¹⁵N-labelled nitrate and ammonium using water samples from the CEEs. Assimilation rates of both nitrate and ammonium were regulated daily, primarily by the ambient concentrations and overall by the rate of nutrient loading, except in the two to three days following copper addition, when acute inhibition of nitrate assimilation was noted; ammonium assimilation was barely affected. Rates returned to normal a few days after

the copper addition. Other acute effects of copper included inhibition of photosynthetic carbon assimilation and synthesis of nitrate reductase, and cell disruption and loss of accumulated ammonium in Noctiluca sp. Evidence indicates that copper severely limits phytoplankton growth, and results in a change from the initial species composition to a copper-resistant assemblage. Even after this selection process, the copper in the CEEs remained in a chemical form toxic to control phytoplankton. The degree of copper tolerance of the phytoplankton was related to ambient copper concentrations. Overall phytoplankton levels and settlement rates were related to the rate of nutrient loading. Remineralization of nitrogen to ammonium was rapid and important. (Lynch-Wisconsin)

W78-01915

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT, Marine Lab., Aberdeen (Scotland). G. Topping, and H. L. Windom. Bulletin of Marine Science, Vol. 27, No. 1, p. 135-141, 1977. 6 fig, 5 tab, 10 ref. NSF OCE 73-09763.

Descriptors: *Translocation, *Copper, Phytoplankton, Zooplankton, Primary productivity, Carbon, Water pollution, Pollutants, Sea water, Ecosystems, Grazing, Adsorption, Canada. Identifiers: Scotland, Saanich Inlet (Canada), Loch Ewe (Scotland), CEPEX program, Uptake, Controlled Experimental Ecosystem.

Controlled Experimental Ecosystem enclosures (CEEs) were used to relate translocation of added copper to phytoplankton and zooplankton activity. Copper sulfate solutions was injected into CEEs containing seawater (three at Saanich Inlet, Vancouver Is., Canada, and two at Loch Ewe Scotland). At Saanich Inlet, a 50 microgram Cu/l concentration decreased to 30 micrograms/l during the first day, and then gradually decreased over the next 24 days to just over 40% of the originally-added amount. Settlement material generally showed a continuing accumulation of copper. The material consisted almost entirely of phytoplankton which settled rapidly out of the water after addition of the copper. However, only 13% of the loss from the water could be accounted for by uptake; 45% of the loss was unexplained, possibly due to water exchanges over the sides of the CEE. At Loch Ewe both CEEs were dosed with 10 micrograms Cu/l; severe losses of copper took place in both. Percentages of copper in settlement material were 0.8% and 1.1%. Copper loss at both sites seemed directly proportional to the level of phytoplankton primary production, and correlated significantly with carbon and the concentration of soluble copper added. Copper:carbon ratios were higher at Loch Ewe where sediments consisted mainly of fecal pellets, than at Saanich Inlet, whose sediments were mostly phytoplankton, indicating the importance of zooplankton grazing. (Lynch-Wisconsin)

W78-01916

FLOOD EFFECTS ON STREAM ECOSYSTEMS, Soil Conservation Service, Little Rock, AR. For primary bibliographic entry see Field 2E. W78-01919

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER, Southwest Texas State Univ., San Marcos. Aquatic Station. H. H. Hannan, and L. Brox. Hydrobiologia, Vol. 5, No. 1, p. 43-64, 1976. 10 fig, 5 tab, 32 ref.

Descriptors: *Reservoirs, *Limnology, *Physicochemical properties, Water quality,

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Rivers, *Texas, Underground storage, Dissolved oxygen, Thermal stratification, Water quality, Nutrients, Water temperature, Cations.
Identifiers: Guadalupe River(TX), Comal River(TX), Canyon Reservoir(TX), Edwards Underground Reservoir(TX).

A 98-km segment of the Guadalupe River (Texas) and a tributary, the Comal River, were studied to determine the influence of two reservoirs on the physiochemical limnology of the river. Canyon Reservoir is a deep-storage bottom-draining reservoir in Comal County. Depth ranges from 37-40 m, and the reservoir holds 5000 million cu m. Edwards Underground Reservoir is a limestone aquifer in south-central Texas. It is 282 km long by 8-65 km wide, and contains 3.5 billion cu m. The Comal River fed by springs from the underground reservoir, enters the Guadalupe downstream from Canyon Reservoir, which impounds the Guadalupe waters. Six stations on the two rivers were sampled between March 1973 and February 1974 for total phosphate phosphorus, dissolved orthophosphate phosphorus, dissolved nitrate nitrogen, chlorophyll a, dissolved oxygen, percent saturation of oxygen, pH total alkalinity, turbidity, specific conductance, water temperature, calcium, magnesium, sodium, potassium, iron, and copper. In general, impoundment in Canyon Reservoir improved water quality of the Guadalupe River, while inflow from the underground reservoir via the Comal River resulted in deterioration of the river. The combined effect of the two reservoirs included decreases in nitrate nitrogen, pH, alkalinity, specific conductance, calcium, magnesium, and sodium, and increases in percent saturation of oxygen, and potassium. (Lynch-Wisconsin) W78-01920

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA

Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany. T. K. Van, W. T. Haller, G. Bowes, and L. A. Garrard.

Journal of Aquatic Plant Management, Vol. 15, p 29-31, June, 1977. 1 fig, 3 tab, 12 ref.

Descriptors: *Chlorophyll, *Plant growth, *Light quality, Submerged plants, Growth rates, Florida, Aquatic plants, Aquatic weed control.
Identifiers: *Hydrilla verticillata, *Vallisneria spiralis, Hydrocharitaceae, Rodman Reservoir(FL), Orange Co. FL.

Hydrilla verticillata and Vallisneria spiralis plants were collected at various depths in adjoining earthen ponds in Orange County, FL to measure effects of water depth on chlorophyll content. A general decrease in total chlorophyll content at increasing water depths was observed in both plants. However, while chlorophyll a:b ratios remained constant at all depths for Vallisneria, the a:b ratio for Hydrilla decreased from 1.77 at the water surface to 1.15 at a depth of 1.5 m. Hydrilla had longer internodes at greater depths, and this increase in the proportion of stem to leaf may contribute to the lower chlorophyll content and lower chlorophyll a:b ratio at greater depths. The change in favor of chlorophyll-b suggests an adaptation of Hydrilla to spectral changes in deeper waters. To determine whether pigment adaptation occurs, Hydrilla tubers collected in Rodman Reservoir, FL, were germinated and grown under white, green, blue, and red light. Stem elongation was most pronounced under green light, while plants under red light were shorter, stockier, and highly branched. Dry weight yields were higher under red and blue light; green and white light produced the lowest yields. Total chlorophyll content was not affected, but the chlorophyll a:b ratio was lower in plants grown under green light. (Lynch-Wisconsin) W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA

Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany. G. Bowes, T. K. Van, L. A. Garrard, and W. T. Haller.

Journal of Aquatic Plant Management, Vol. 15, p 32-35, June, 1977. 4 fig, 2 tab, 9 ref.

Descriptors: *Light intensity, *Growth rates, Chlorophyll, Florida, Respiration, Photosynthesis, Weight, Aquatic weeds, Submerged plants, Aquatic weed control.
Identifiers: *Hydrilla verticillata, Orange Lake(FL), Rodman Reservoir(FL).

Mature apical stem sections of Hydrilla verticillata and shoots developing from tubers, subjected to low light levels, similarly adapted their photosynthetic and respiratory characteristics to the lower light conditions. Stem sections were collected in Orange Lake, FL and tubers from Rodman Reservoir. In the 15 years since its introduction, Hydrilla has become Florida's most serious aquatic weed problem; its rapid spread in a body of water and dominance over native plants are probably related to its low photosynthetic light requirement. Four quantum flux density levels (6, 30/120 and 300 microeinsteins/sq m/sec-low, intermediate, and high) were obtained using fluorescent and incandescent lamps varied with neutral density filters. For apical stem sections, photosynthetic rates were higher under low and intermediate light than under high light, and the light saturation point was four times as great under light than under low light. The light-saturated photosynthetic rate under high light was 5.4 micromoles CO₂/mg Chl/hr, and only 2.6 under low light. Photorespiration rates seemed unaffected by the light levels, but chlorophyll concentration increased as light level decreased, except at the lowest level. All plants increased in length and fresh weight, although at the lowest level a decrease in dry weight occurred; below 10-12 microeinsteins/sq m/sec plants were incapable of increasing in dry weight. Larger tubers produced shoots that were both longer and had a higher survival rate than smaller ones. (Lynch-Wisconsin) W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

T. R. Batterson.
Journal of Aquatic Plant Management, Vol. 15, p 36-40, June, 1977. 4 fig, 1 tab, 21 ref. EPA T-900331.

Descriptors: *Aquatic weed control, *Calcium, *Phosphorus, *Calcium compounds, Salts, Nutrients, Nutrient requirements, Growth rates, Absorption, Michigan.
Identifiers: *Coontail, *Ceratophyllum demersum.

A study of calcium salts (carbonate and sulfate) for controlling coontail (Ceratophyllum demersum) through phosphorus inactivation in lake water showed that a compound currently being developed for commercial aquatic weed control, composed of 80% calcium sulfate (by weight), 17% aluminum sulfate, 1% boric acid, and 2% inert ingredients, would be ineffective against the plant at the specified maximum dosage of 21 ppm. Experiments were conducted using plastic bags in an aerobic waste stabilization pond at Belding, MI. Coontail was selected as the test plant because its tissue concentration of phosphorus is known to respond proportionally to available ambient phosphorus concentrations. Total alkalinity, phenolphthalein alkalinity, total hardness, orthophosphate, total phosphate, pH, and temperature were monitored in the water, and coontail were analyzed for dry weight, ash-free dry weight, and tissue phosphorus concentration. Calcium salts (CaCO₃, CaCO₄, and a combination at 1:1)

were applied at 0, 7, 14 and 21 ppm in triplicate for each of 12 treatment combinations. Coontail showed no response to these treatments, in either productivity or tissue concentration of phosphorus. Although total phosphorus in the ambient water declined significantly, plants responded as though concentrations were constant. (Lynch-Wisconsin) W78-01928

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS

Florida Game and Fresh Water Fish Commission, Eustis.

C. C. Carter, and R. S. Hestand.
Journal of Aquatic Plant Management, Vol. 15, p 47-56, June, 1977. 3 fig, 6 tab, 19 ref.

Descriptors: *Herbicides, *Aquatic weed control, *Diquat, Environmental effects, Phytoplankton, Sulfur bacteria, Bacteria, Toxicity, Florida, Submerged plants, Chara, Succession.
Identifiers: *TD-1874, *Hydrothol 191, *System E, Endothall, Hydrilla verticillata, Water milfoil, Myriophyllum spicatum, Coontail, Ceratophyllum demersum, Vallisneria spiralis, Najas guadalupensis.

Effects of four herbicides on six submerged plant species were tested in plastic pools in central Florida. The herbicides included three salt formulations of endothall (TD-1874, Hydrothol 191, and System E) and Diquat with Cutrine Plus. Plants tested were Hydrilla verticillata, Eurasian water milfoil (Myriophyllum spicatum), coontail (Ceratophyllum demersum), muskgrass (Chara sp.), Vallisneria spiralis, and southern naiad (Najas guadalupensis). All except System E resulted in 100% control of the submerses macrophytes, high turbidity due to dense sulfur bacteria and phytoplankton blooms, and putrid odors of H₂S gas from decaying fish, invertebrates, and macrophytes. Pools treated with System E, the dihydroxy aluminum salt of endothall, were characterized by low turbidity and no unpleasant odor. Muskgrass, the only plant not eliminated by System E, instead persisted and crowded out the affected plants, utilizing nutrients released during decomposition. Muskgrass capacity for nutrient removal hindered planktonic algal growth, not only eliminating high bacteria counts as plants decomposed, but phytoplankton populations as well. The succession of bacteria, flagellates, and green, blue-green, and yellow-green phytoplankton in control and treated pools is presented in tabular form. (Lynch-Wisconsin) W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO EGGS, ALEVINS, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES

Agricultural Research Service, Washington, DC. R. R. Yeo, and N. Dechoretz.
Journal of Aquatic Plant Management, Vol. 15, p 57-60, June, 1977. 3 tab, 25 ref.

Descriptors: *Rates of application, *Herbicides, *Diquat, *Rainbow trout, Copper, Ions, Algae, Toxicity, California, Spawning, Fry, Mayflies, Chinook salmon, Fish, Fish hatcheries.
Identifiers: *Copper ion, *Salmo bairdieri, Baetis bicaudatus, Tropisternus lateralis, Cladophora glomerata, Oncorhynchus tshawytscha, Alevins.

A combination of the herbicide diquat plus copper ion, which has been used to control algae in chinook salmon artificial spawning channels, was tested for lethal effects on eggs, alevins, and fry of steelhead rainbow trout (Salmo gairdneri), and on mayfly nymphs (Baetis bicaudatus) and immature water scavenger beetles (Tropisternus lateralis), common in the channels. Eggs of steelhead rain-

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bow trout, a salmonid fish, were used in the study because fertilized salmon eggs were unavailable. Experiments were conducted at the downstream end of the fish access channel at the Tehama-Colusa Fish Facility at Red Bluff, California. The recommended application rate of the herbicide for algae control is 100 ppbw diquat plus 150 ppbw copper ion applied for three hours. Various concentrations of diquat (25-8,000 ppbw) plus copper ion (35-12,000 ppbw) were used. Concentrations up to 800 ppbw diquat plus 1,200 ppbw copper ion did not significantly affect the number of viable or hatched eggs, or alevins (6-9%, 8-12%, and 0% mortality respectively). At 4,000 plus 6,000 ppbw all alevins were killed. A significant number of fry (20%) and mayfly larvae (34%) were killed at 400 plus 600 ppbw, but not at the dosage recommended for algae control. Up to 800 plus 1,200 ppbw water scavenger beetles were unharmed; at 4,000 plus 6,000 ppbw mortality was 17%. (Lynch-Wisconsin) W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES

Florida Game and Fresh Water Fish Commission, Eustis. R. S. Hestand, and C. C. Carter. Journal of Aquatic Plant Management, Vol. 15, p. 60-64, June, 1977. 5 fig, 11 ref.

Descriptors: *Herbicides, *Succession, *Diquat, *Aquatic weed control, Florida, Chara, Submerged plants, Toxicity.

Identifiers: *System E, *TD-1874, *Hydrothol 191, Endothal, Coontail, Ceratophyllum demersum, Vallisneria spiralis, Hydrilla verticillata, Myriophyllum spicatum, Water milfoil, Najas guadalupensis.

Tests with four herbicides—TD-1874, Hydrothol 191, System E, and Diquat with Cutrine Plus—applied to six submersed plant species in plastic pools to document resultant lethal effects and plant succession, showed that selective management of species composition is possible. Treatment with TD-1874 and Hydrothol 191 caused eventual hydrilla dominance; System E resulted in muskgrass dominance; and Diquat with Cutrine Plus caused eelgrass dominance. The experiment in central Florida involved coontail (Ceratophyllum demersum), muskgrass (Chara sp.), eelgrass (Vallisneria spiralis), Hydrilla verticillata, Eurasian water milfoil (Myriophyllum spicatum), and southern naiad (Najas guadalupensis). Each pool was planted with equal amounts of each species and allowed to stabilize for a year. Average cover before treatment was 37% hydrilla, 26% southern naiad, 18% water milfoil, 14% muskgrass, 14% eelgrass, and 4% coontail. All herbicides except System E rapidly controlled all plants; System E worked more slowly and did not affect muskgrass. With Hydrothol 191 and TD-1874 hydrilla ultimately achieved 75% and 70% dominance after 90 days followed by southern naiad at 25% and 30%. Diquat with Cutrine Plus resulted in long-term control, with eelgrass (50%) and hydrilla (35%) eventually becoming dominant. With System E long-term control was evident, but the immunity of muskgrass resulted in its dominance (50% cover); southern naiad and hydrilla each achieved 15% cover. (Lynch-Wisconsin) W78-01932

THE EARLY SUMMER BLOOM OF DINOFLAGELLATES IN THE NORTH SEA

SPECIAL REFERENCE TO 1971. Birbeck Coll., London (England). Dept. of Botany. J. D. Dodge. Marine Biology, Vol. 40, No. 4, p. 327-336, 1977. 4 fig, 1 tab, 19 ref.

Descriptors: *Data collections, *Dinoflagellates, *Phytoplankton, Diatoms, Algae, Aquatic algae,

Aquatic plants, Distribution, Plankton, Stratification, Turbidity. Identifiers: *North Sea, Chaetoceros, Gonyaulax tamarensis, Dinophysis norvegica.

Observations since 1968 in the North Sea adjacent to the NE coast of England show an annual bloom of dinoflagellates in late May and June. During Spring, 1971 the entire water column in the study area was sampled using a 256 mesh net. In March, when the spring diatom burst would be expected, turbulent and turbid water prevented stratification, indicating low temperature throughout the water column. Only away from shore in deeper water was there an appreciable production of diatoms and dinoflagellates during March. By early May, when the calmer and less turbid water became stratified, a massive bloom of diatoms (mainly Chaetoceros spp.) had spread across the northern half of the area. Fairly large numbers of dinoflagellates were included (e.g., Gonyaulax tamarensis). The diatom bloom died away, including G. tamarensis, followed by extensive growths of other dinoflagellates dominated by Dinophysis norvegica. Maximum counts of over 28 million dinoflagellates/cu m were recorded. In the southern part of the survey area, which does not become appreciably stratified, few dinoflagellates were produced, except in the southern swirl. There may be a critical salinity for the growth of Ceratium furca and C. tripos, which aligned along the 34.5‰ isohaline. A total of 61 species of dinoflagellates were found during the survey. (Lynch-Wisconsin) W78-01934

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences. W. G. Hansen, G. Bitton, J. L. Fox, and P. L. Brezonik. Marine Pollution Bulletin, Vol. 8, No. 3, p. 57-62, March, 1977. 3 fig, 4 tab, 27 ref. Dept. of Environ. Regulation, Florida.

Descriptors: Organic compounds, *Sediments, *Florida, *Canals, Water pollution sources, Aerobic bacteria, Urban runoff, Gas chromatography, Storm runoff.

Identifiers: *Punta Gorda (FL), *Port Charlotte (FL), *Lexahatchee River (FL), *Pompano Beach (FL).

Levels of hydrocarbons and related bacterial populations in Florida real estate canal sediments were studied. Canals at Punta Gorda and Port Charlotte on the west coast of southern Florida and at Pompano Beach and the Loxahatchee River on the east coast were examined. The highest level of total hydrocarbons observed, was 4.60 mg per 100 g of wet sediment, at a station in the Port Charlotte canals. Gas chromatography indicated that 10 of the 16 components found at various localities were n-paraffins ranging from tetradecane to heptacosane. The number present at each locality varied. A significant difference at the 95% confidence level was observed in the hydrocarbon content between the east and west coast canals. Petroleum hydrocarbons usually have a ratio of the sum of the amounts of even carbon numbered alkanes to odd carbon numbered alkanes approaching 1.0, while those from biological sources show ratios nearer to zero. The ratio at the Loxahatchee River sediments was 0.29, at Pompano Beach 0.50, and at Punta Gorda and Port Charlotte were 0.82. This indicates some possible cultural input at the latter sources. The percentage of aerobic, hydrocarbon degrading bacteria relative to the total number of aerobic bacteria was higher at Punta Gorda (3.8%), and Port Charlotte (16.7%), than at Pompano Beach (0.2%), and Loxahatchee River (0.04%). (Spaeth-Wisconsin) W78-01935

THE EFFECTS OF DIMETHYL PHTHALATE ON THE GROWTH OF PSEUDOMONAS AERUGINOSA

Our Lady of the Lake Coll., San Antonio, TX. J. A. Perez, J. E. Downs, and P. J. Brown. Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p. 486-490, 1976. 3 fig, 19 ref. NIH 5-S06-RR-80877-03.

Descriptors: *Degradation (Decomposition), *Pseudomonas, Bacteria, Assay, Pollutants, Water pollution, Industrial wastes, Plastics. Identifiers: *Phthalic acid esters (PAE), *Dimethyl phthalate (DMP), Plasticizers, Phthalates.

Phthalic acid esters (PAEs), persistent environmental contaminants used as plasticizing agents that reach the environment via waste plastics or directly from industrial manufacturers, are known to be rapidly biodegraded by microbes. In this study the effect of the PAE dimethyl phthalate (DMP) on the growth rate of the bacterium Pseudomonas aeruginosa is examined. DMP was incorporated into media containing P. aeruginosa at concentrations of 10, 100, 500, 1000, and 1500 ppm. After 0 and 10 hours of incubation growth of P. aeruginosa was not inhibited at concentrations of 10 to 1000 ppm, but was only slightly inhibited at 1500 ppm. After 24 hours of incubation no inhibition at any concentration was observed. In fact, growth increase over the control was noted at concentrations of 10 to 1000 ppm after 0, 10, and 24 hours of incubation at rates of 5.5-15.8%. Even after 48 hours of incubation (death phase) the cell concentrations of P. aeruginosa in the 10 and 100 ppm cultures still exceeded the control by 4.9 and 2.9%. These results suggest that the bacterium may be utilizing DMP as a carbon source, and therefore P. aeruginosa would be a likely candidate for the utilization and degradation of DMP. (Lynch-Wisconsin) W78-01937

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES

New Jersey Agricultural Experiment Station, New Brunswick. For primary bibliographic entry see Field 5B. W78-01938

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN

Scripps Institution of Oceanography, La Jolla, CA. For primary bibliographic entry see Field 5B. W78-01939

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT

Woods Hole Oceanographic Institution, MA. For primary bibliographic entry see Field 5A. W78-01941

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN I. EFFECTS OF PHYTOPLANKTON

Saint Andrews Univ. (Scotland). Dept. of Botany. B. P. Jupp, and D. H. N. Spence. Journal of Ecology, Vol. 65, No. 1, p. 175-186, 1977. 4 fig, 2 tab, 35 ref.

Descriptors: *Eutrophication, *Submerged plants, *Algae, *Phytoplankton, Aquatic plants, Phosphorus, Nutrients, Turbidity, Biomass, Lakes. Identifiers: *Loch Leven (Scotland), Scotland, Macrophytes, Species diversity, Chara aspera, Nitella opaca, Potamogeton filiformis, Zannichellia palustris, Anabaena.

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Group 5C—Effects Of Pollution

The decline in both abundance and diversity of submerged macrophytes in Loch Leven (Scotland), a shallow, nutrient-enriched lake near Edinburgh, is attributed to high phytoplankton densities resulting from cultural eutrophication. About 67% of its catchment is agricultural land used for grassland, cereals, vegetables, fruit, and poultry farming. In 1910, 23 species of submerged macrophytes were recorded, many abundant, which colonized to a depth of 5 m. Now there are only 12 species, of which only four are abundant: *Chara aspera*, *Nitella opaca*, *Potamogeton filiformis*, and *Zannichellia pallustris*. All 12 are restricted to water less than 1 m deep. *P. filiformis* and *Z. pallustris* are indicators of cultural enrichment. The present study, covering 1972-74, analyzed data on biomass, light intensity and penetration, temperature, pH, nitrate-N, phosphate-P, total P, and chlorophyll. In 1972-73, competition from algal blooms between May and October adversely affected the biomass of *P. filiformis*. This could be partly explained by underwater light attenuation by high chlorophyll levels. The attenuation was particularly serious when the bloom consists of buoyant blue-green algae such as *Anabaena* spp., which can form dense floating scums over macrophyte beds. Where levels of phosphorus (phosphate plus total P) exceed 0.05 mg/l during summer months, blue-green algae blooms which may retard macrophyte growth are likely to occur. (Lynch-Wisconsin) W78-01942

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS, Battelle Columbus Labs., OH. D. C. Cooper, and B. J. Copeland. Ecol Monogr. 43(2), p 213-236, 1973.

Descriptors: Water pollution sources, Microorganisms, Chlorophyta, Chrysophyta, Cladocera, Copepoda, Cyanophyta, *Ecosystems, Effluents, Environmental effects, Estuarine environment, Euglenophyta, Nematoda, Ostracoda, Polychaeta, Primary productivity, Protozoa, Respiration, Rotifers, Standing crops, Industrial wastes.

Six continuous-series microecosystems, each containing 5 cells, were constructed to simulate hydrological factors of estuarine regions. Exchange and retention characteristics were adjusted to closely model the hydrological conditions of Trinity Bay, Texas. The metabolic and structural responses of the microecosystem communities to quantitative and qualitative changes in freshwater input were investigated. Primary production and community respiration in the 1st 3 cells of the microecosystems were dependent on both quantity and quality of freshwater input, whereas primary production and community respiration in the saltwater portions (cells 4, 5) of the microecosystems were virtually independent of the quantity and quality of freshwater input. Metabolism of the freshwater portions of the microecosystems was heterotrophic under normal flow conditions and autotrophic under drought conditions. Addition of an industrial effluent to the freshwater inputs resulted in extensive shifts towards metabolic heterotrophy of the more freshwater portions of the microecosystems. Metabolism of the saltwater cells was heterotrophic under all conditions of freshwater input. The upstream communities were adapted to a dependency on allochthonous materials input for production and respiration maintenance. Retarding freshwater input resulted in tying up larger portions of the nutrient pool within the systems in living components. Addition of industrial effluent increased the community maintenance requirements. Retarding freshwater input acted as an environmental stress on the 1st 3 cells of the microecosystems. Magnitudes of production and respiration were significantly lower, and zooplankton standing crops and species diversity decreased significantly. Addition of industrial effluent produced similar effects. Decreased freshwater input rate

(primary stress) rendered the receiving communities more susceptible to the industrial effluent addition (secondary stress). The organismal composition of the microecosystems was qualitatively similar but quantitatively dissimilar to the organismal composition of Trinity Bay. Because of fundamental similarities in all living systems, the observed responses might be especially representative of those which would occur in Trinity Bay if subjected to similar hydrological alterations.—Copyright 1974, Biological Abstracts, Inc. W78-01944

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY, Old Dominion Univ. Research Foundation, Norfolk, VA. For primary bibliographic entry see Field 5A. W78-01946

SOME PRELIMINARY OBSERVATIONS ON THE ENHANCEMENT OF PHYTOPLANKTON GROWTH BY LOW LEVELS OF MINERAL HYDROCARBONS, British Columbia Univ., Vancouver. Inst. of Oceanography. T. R. Parson, W. K. W. Li, and R. Waters. Hydrobiologia, Vol 51, No 1, p 85-89, 1976. 4 fig, 1 tab, 8 ref.

Descriptors: *Organic compounds, *Photosynthesis, *Oily water, *Phytoplankton, Fuels, Nannoplankton, Environmental effects, Adsorption, Marine algae. **Identifiers:** *Chrysochromulina kappa, Nitzschia sp., Olisthodiscus luteus, Skeletonema costatum, Dunaliella tertiolecta, Isochrysis galbana, Alkanes.

Effects of low hydrocarbon concentrations on marine algae under laboratory and field conditions were examined. In laboratory experiments, *Nitzschia* sp. and *Olisthodiscus luteus*, showed increased photosynthesis at low hydrocarbon concentrations, which decreased with increasing hydrocarbon concentration. *Skeletonema costatum* showed increased photosynthesis when treated with aromatics or alkanes, but decreased photosynthesis when treated with alkenes. *Dunaliella tertiolecta* decreased photosynthesis as concentrations of alkanes, alkenes, or aromatics increased. *Isochrysis galbana* showed decreased photosynthesis at all hydrocarbon concentrations. An increase of aromatic hydrocarbons to concentrations between 75 and 220 ppb, caused an increase in nanoplankton of 6-16 millimicron diameter. Increases in chlorophyll-a concentrations were mainly caused by *Chrysochromulina kappa*, which was further cultured in the laboratory. In the latter, photosynthesis increased by treatment with low concentrations of hydrocarbons, when bicarbonate uptake was measured 72 hours after treatment. Enhancement of carbon-14 uptake by number 2 fuel oil tends to maximize at about 50 ppb, and then declines. Twelve hour incubations gave either no response, or slight inhibition of photosynthetic activity. (Spaeth-Wisconsin) W78-01951

LOCH EWE BAG EXPERIMENT, 1974, Marine Lab., Aberdeen (Scotland). J. C. Gamble, J. M. Davies, and J. H. Steele. Bulletin of Marine Science, Vol. 27, No. 1, p 146-175, 1977. 25 fig, 6 tab, 48 ref.

Descriptors: *Plankton, *Ecosystems, Ecology, Phytoplankton, Zooplankton, Copper, Primary productivity, Diatoms, Research equipment, Predation. **Identifiers:** *Controlled Experimental Ecosystems, CEPEX program, Ctenophores, *Bolinopsis infundibulum*, *Cerataulina pelagica*, *Chaetoceros*, *Loch Ewe(Scotland), Scotland.

Four clear polyethylene enclosures (Controlled Experimental Ecosystem enclosures, or CEEs) 17 m long were used during Spring 1974 to study planktonic ecosystems in Loch Ewe, Scotland. Studies included rates of nutrient enrichment, variations in predator numbers and additions of copper. Mean water depth in the area of the experiment was about 26 m. Differences in rates of nutrient enrichment altered the rate of primary production without greatly altering phytoplankton biomass. For the two bags with only small nutrient additions, the primary production rate was about half that in the natural environment. Variations in phytoplankton population structure and herbivore biomass were apparently due to varying predator numbers. The dominant carnivore was the lobate ctenophore *Bolinopsis infundibulum*. Experiments showed that an average-sized (6 mg dry wt) individual can consume over 100 adult copepods, such as *Acartia* and *Temora*, per day. In all bags and in the sea, a bloom of the diatom *Cerataulina pelagica* occurred during May, 1974, accompanied by *Rhizosolenia* spp. Disappearance of the bloom by July was correlated to an infection by an intracellular chytrid parasite. Evidence of an effect of copper was at best circumstantial; any effects were probably less than those arising from nutrient addition or predator variations. (Lynch-Wisconsin) W78-01954

EFFECTS OF ORGANIC PHOSPHATE ON THE GROWTH AND MORPHOLOGY OF SCENEDESMUS OBTUSIUSCULUS (CHLOROPHYCEAE), Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany. T. J. Monahan. Phycologia, Vol. 16, No. 2, p 133-137, 1977. 2 fig, 1 tab, 12 ref. RUCR 07-2177, BSSG RR7059.

Descriptors: *Scenedesmus, *Growth rates, *Phosphates, Population, Cultures, Density. **Identifiers:** *Scenedesmus obtusiusculus, *Glycerophosphate medium, *Bristol's medium, Colony formation, Unicells, Polymorphism.

A study of the effects of organic and inorganic phosphate on the growth and morphology of the spinless, polymorphic green alga *Scenedesmus obtusiusculus* in laboratory cultures showed that organic phosphate (as glycerophosphate) supports a higher rate of growth than does inorganic phosphate. In limited volume cultures, in Bristol's medium, maximum colony formation of about 60 cents occurred, while cultures were in logarithmic or near logarithmic growth. Maximum colony formation of about 80% occurred while the cultures were in a declining phase of growth in glycerophosphate medium. Glycerophosphate cultures maintained about 93% colonies, and averaged 1.13 doubling-day-1 in cell number, while Bristol cultures showed a gradual increase in colony production, reaching a maximum of 70% colonies, and averaged 0.90 doublings-day-1 in cell number. Comparison of *S. obtusiusculus* grown in media containing inorganic and organic phosphate sources, demonstrates that the form of phosphate is a morphogenic factor in growth and colony formation. Phosphate in freshwaters is usually associated with organic matter. Most laboratory studies of fresh water micro-algal morphology, are made with media containing inorganic phosphate. In field collections, spinless *Scenedesmus* similar to *S. obtusiusculus* are often observed in colonies. Unicellular populations are common in laboratory culture. (Spaeth-Wisconsin) W78-01955

EDAPHIC DIATOM COMMUNITIES ASSOCIATED WITH SPARTINA ALTERNIFLORA AND S. PATENS IN NEW JERSEY, Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology. M. J. Sullivan. Hydrobiologia, Vol. 52, No. 2-3, p 207-211, 1977. 3 tab, 8 ref.

Descriptors: *Diatoms, *Salt marshes, Communities, New Jersey, Grasses, Brackish water.
Identifiers: *Spartina alterniflora, *Spartina patens, Tuckerton(NJ), Edaphic diatom communities.

A study describes the composition of edaphic diatom communities of sediments underlying the marsh grasses *Spartina alterniflora* and *S. patens* in the Great Bay salt marsh, Tuckerton (NJ). Forty-nine diatom taxa collected in the study were constituents of the edaphic communities associated with dwarf *S. alterniflora* and 83 taxa with *S. patens*. There were eight taxa in the dwarf *S. alterniflora* community and 42 in the *S. patens* community. Forty-one taxa were common to both. Endemic taxa made up 1.8% of the *S. alterniflora* community and 18.8% of all individuals counted in the *S. patens* community. A highly significant relationship (P less than 0.001) between the number of diatom taxa and the marsh surface salinity at the *S. patens* habitat was demonstrated by least-squares regression analysis. Thus it was assumed that dissimilarity in the structure of the two edaphic diatom communities was primarily due to the very low marsh surface salinities at the *S. patens* habitat from January through June, and that this sustained low-salinity regime allowed a very large number of taxa to coexist only in the *S. patens* community. Values for species diversity (H'), and evenness (J') indices and the number of diatom taxa contained in each sample, were averaged for the twelve collection dates, and given for each habitat. The *S. patens* community was much larger for all three values than *S. alterniflora*. The calculated value of SIMI (similarity index) was 0.746 for a comparison between edaphic diatom communities associated with dwarf *S. alterniflora* and *S. patens* on a yearly basis. (Spaeth-Wisconsin) W78-01956

THE EFFECTS OF SOME DETERGENTS ON THE GROWTH OF NITZSCHIA HOLSATICA HUST. (DIATOMAEAE), Helsinki Univ. (Finland). Dept. of Botany. H. Nyberg. Annales Botanici Fennici, Vol. 13, No. 2, p 65-68, 1976. 6 fig, 14 ref.

Descriptors: *Inhibition, *Growth rates, *Detergents, Toxicity, Temperature, Vegetation effects.
Identifiers: *Sodium dodecyl sulphate, *Triton X-100, *Sodium desoxycholate, *Cetyl trimethylammonium bromide, *Nitzschia holsatica.

The effect of the four detergents sodium dodecyl sulphate (SDS), Triton X-100, sodium desoxycholate (NaDOC), and cetyl trimethylammonium bromide (CTAB) on the growth of pure culture of the planktonic diatom *Nitzschia holsatica* Hust. from the Gulf of Finland were studied. The detergents were either alone, or in two-compound mixture. The detergents usually retarded the growth of *N. holsatica* to a varying degree. CTAB is the most inhibitory of the four compounds at both 15 C and 25 C; SDS, Triton X-100, and NaDOC are slightly less harmful. Triton X-100 has temperature-dependent effects. At low concentrations at 25 C, very slight growth promotion can be seen. SDS moderately inhibits growth but is not as harmful as Triton X-100 at higher concentrations. All mixtures containing CTAB were very toxic at 15 mg/l at 15 C and their toxic effect could already be observed at 5 mg/l at both temperatures. Growth curves of mixtures not containing CTAB show no great difference between them, but differ quite clearly from CTAB mixture curves, especially at 15 C. Several mixtures exhibited more toxicity than their separate components at corresponding concentrations. (Spaeth-Wisconsin) W78-01958

THE RELATIONSHIP BETWEEN PLANKTONIC ALGAE AND BACTERIA IN SMALL LAKE, Alberta Univ., Edmonton. Dept. of Botany.

M. Hickman, and I. D. Penn. Hydrobiologia, Vol 52, No 2-3, p 213-219, 1977. 3 fig, 62 ref.

Descriptors: *Phytoplankton, *Aerobic bacteria, *Anaerobic bacteria, *Depth, *Seasonal, Chemical stratification, Thermal stratification, Hypolimnion, Organic matter, Reproduction.
Identifiers: *Bacterioplankton, *Abbot's pond(England), Oxygen depletion.

Studies were made on Abbot's Pond, near Somerset, England, a small, edaphically eutrophic lake to determine the relationship between bacterioplankton and phytoplankton during different seasons and at different depths. Thermal and chemical stratification occur annually with strong summer oxygen depletion in the hypolimnion. Anaerobic bacteria show almost no change with depth until June stratification, when they begin to increase with increasing depth below two meters. After stratification breakdown in autumn, anaerobic bacteria numbers decrease and show almost no change with depth. Aerobic bacteria and phytoplankton exhibit a more-irregular distribution with increasing depth. On April 8, May 6, Aug. 19, October 28, and November 25, 1969 only, vertical distribution of algae correlated closely with aerobic bacteria. During the stratified period, aerobic bacteria increased with increasing depth, especially below two meters. All three groups of organisms showed numerical increase on August 19th and September 9th. Bacterial populations are dependent on the amount of organic matter in the water. Larger summer bacterial could be due to increased water temperatures. Some of the irregular vertical distributions may be due to the fast speed with which some bacteria reproduce. (Spaeth-Wisconsin) W78-01960

NITROGEN FIXATION BY BLUE-GREEN ALGAL COMMUNITIES IN THE INTERTIDAL ZONE OF THE LAGOON OF ALDABRA ATOLL, Durham Univ. (England). Dept. of Botany. M. Potts, and B. A. Whitton. Oecologia, Vol 27, No 4, p 275-283, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Cyanophyta, *Nitrogen fixation, *Algae, *Reduction(Chemical), *Intertidal areas, *Lagoons, Photosynthetic bacteria, Sulfur bacteria, Light, Temperature, Indian Ocean.
Identifiers: *Acetylene, *Aldabra Atoll(Indian Ocean), Hyella balani, Scytonema sp, Rivularia sp, Purple sulfur, Photosynthetic bacteria, Varying media, Gas regimes.

Nitrogen fixation by blue-green algae of the intertidal zone of the lagoon at Aldabra Atoll, Indian Ocean, was studied. Locally-uniform areas of blue-green algae or mixed blue-green algae-purple sulfur photosynthetic bacteria community were selected and acetylene reduction by community samples were measured in both light and darkness. In the field, all experiments showed higher acetylene reduction rates in the light than in dark, except for two of the three experiments on the Hyella balani-purple sulfur bacterial community. Or 31 experiments, 21 showed a statistically significant differences between light and dark ($P < 0.05$). The rate of acetylene reduction was greater in light than in dark with the seven communities dominated by blue-green algae. There was no clear difference between the rates obtained with brackish water in contrast to sea water. Wide ranges of laboratory experiments were carried out with re-wetted materials of Hyella balani, Scytonema sp., and Rivularia sp. Various temperature, light, media and gas regimes were used. Detectable rates of acetylene reduction were found with only one population of Scytonema sp. Tests with this population showed a mean rate of reduction under light of approximately 10%. (Spaeth-Wisconsin) W78-01961

THE ROLE OF MAN IN THE EXCESSIVE FERTILIZATION OF SURFACE WATERS, Texas Univ. at Dallas, Richardson. Center for Environmental Studies. M. D. Piwoni, and F. G. Lee. The Texas Journal of Science, Vol 27, No 4, p 477-487, December, 1976. 3 tab, 14 ref.

Descriptors: *Eutrophication, *Nutrients, *Phosphorus, *Nitrogen, *Impoundments, Water quality, Lakes, Algae, Water pollution sources, Pollutants, Runoff, Sewage, Texas, Wisconsin, Colorado River, Watersheds(Basins), Rivers, Human population.
Identifiers: Trinity River(TX), Lake Mendota(WI).

The general nature of eutrophication is discussed with reference to pioneering studies of the Lake Mendota (WI) watershed, and then studies of nutrient sources and contents of Texas impoundments are reviewed. It is concluded that data for sound eutrophication management in Texas is lacking. Tables present data on nitrogen and phosphorus runoff sources in Dane Co., WI; surface area-to-depth ratios for Texas impoundments; and phosphate loading to Texas rivers from municipal sewage sources. The flow of the Trinity River, one of the major streams in east-central Texas, is controlled by several impoundments. During low-flow periods, sewage effluent constitutes a 90% of the river's flow in the Dallas area. Ninety per cent of the phosphorus below Dallas during low flow is ortho or soluble phosphate. Sewage treatment plants, accounting for 25% of the annual phosphorus load are also the main source of nitrogen during low flows, contributing 40,000 lbs/day. Nuisance algal levels have been kept down so far because of insufficient concentrations of available nitrogen, but this situation could change. Seven impoundments on the Colorado River in central Texas are discussed; other Texas rivers are also mentioned. Studies are needed to determine if removal of nitrogen and phosphorus at pollution sources would be important in slowing eutrophication in Texas impoundments. (Lynch-Wisconsin) W78-01963

DRAPARNALDIOPSIS: A FILAMENTOUS ALGA (CHLOROPHYTA, CHAETOPHORACEAE) REQUIRING VITAMIN B12, Kansas Univ., Lawrence. Dept. of Botany. I. M. Johnstone. Phycologia, Vol. 16, No. 2, p 183-187, 1977. 2 fig, 2 tab, 34 ref.

Descriptors: *Nutrient requirements, *Chlorophyta, *Vitamin B, Algae, Light intensity, Temperature, Light, Frequency, Montand.
Identifiers: *Draparnaldiopsis, *Vitamin B12, Draparnaldia, Chaetophoraceae, Biotin, Thiamine.

Research on the nutritional needs of Draparnaldiopsis salishensis Prescott shows that this trophical and temperature freshwater alga requires an external source of vitamin B12 for growth—the first report of a member of the Chaetophorales having any vitamin requirement. When an attempt was made to compare the behavior of Draparnaldiopsis and Draparnaldia in culture during earlier research, it was found that the former could not grow successfully on media used for the latter. This failure led to the discovery of the vitamin requirement of *D. salishensis*. Cultures of the green alga were grown under 14 hours light to 10 hours dark, 20 C, and light intensities of 1000 and 5000 lux. Chlorophyll analyses were used to estimate the total growth after twenty days. The response to biotin, thiamine, and B12 (cyanocobalamin) was determined by adding each vitamin individually and in combination. Vitamin B12 at 10(-4) mg/l is enough for twenty days active growth. Small amounts of growth occurring in test culture lacking B12 were probably caused by the

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presence of some of the vitamin in the quite large thallus of the innoculum. *D. salishensis* does not require biotin or thiamine. The requirement for vitamin B12 probably evolved independently in *Draparnaldopsis*. (Spaeth-Wisconsin)
W78-01965

OXYGEN DEFICITS, CLARITY, AND EUTROPHICATION IN SOME MADISON LAKES.
State Univ. of New York at Buffalo. Dept. of Biology.
K. M. Stewart.
International Revue Der Gesamten Hydrobiologie, Vol. 61, No. 5, p 563-579, 1976. 9 fig, 59 ref. NSF G-14530.

Descriptors: *Eutrophication, *Trophic level, *Dissolved oxygen, Oxygen, Secchi disks, Turbidity, Water temperature, Phytoplankton, Ice cover, Algae, Water quality, Wisconsin, Productivity.
Identifiers: *Lake Mendota(WI), *Lake Monona(WI), *Lake Waubesa(WI), Madison(WI), Oxygen deficit, Oxygen depletion.

Oxygen deficit, oxygen depletion rates, Secchi disk measurements, and other trophic indices were used in an attempt to document eutrophication in lakes Mendota, Monona, and Waubesa at Madison (WI). Data from 1906-07, 1961-63, 1966-67, and 1970-71 proved inadequate for determining trophic trends in the lakes. Possible reasons given include: (1) the Madison lakes were as eutrophic several decades ago as they are now; (2) the systems are too complex and data and understanding too limited to make definite judgments; (3) the years represented or compared are inadequate; (4) thinking in terms of oligotrophic, mesotrophic, and eutrophic may obscure subtle changes within one category; (5) core samples may be more useful for measuring trophic trends; and (6) oxygen deficits may be of a limited value as indicators of productivity in lakes that are already eutrophic. The data indicated that in all but one year (1907 in Lake Mendota), the rates of oxygen depletion in the Madison lakes (3.6-10.2 mg/l/month) exceeded that estimated for Lake Erie (3.6 mg/l/month). Judged on this basis alone, the Madison lakes have been considerably more eutrophic than Lake Erie for several decades. The oxygen deficits show variations between years, but no trends; these variations may reflect differences in mean hypolimnetic temperatures as much as man's cultural influences. Lateness of ice out was found to correlate significantly with oxygen deficit or depletion during summer stratification. (Lynch-Wisconsin)
W78-01966

DETERMINATION OF SAMPLING STRATEGY FOR BENTHIC MACROPHYTES IN POLLUTED AND UNPOLLUTED COASTAL AREAS.
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5A.
W78-01967

TOXIC EFFECTS OF CADMIUM ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTINALIS).
Environmental Research Lab., Duluth, MN.
D. A. Benoit, E. N. Leonard, G. M. Christensen, and J. T. Fiandt.
Transactions of the American Fisheries Society, Vol. 105, No. 4, p 550-560, July, 1976. 3 fig, 2 tab, 32 ref.

Descriptors: *Cadmium, *Brook trout, *Pesticide residues, *Lake Superior, Fish genetics, Fishkill, Water pollution effects, Reproduction.
Identifiers: *Salvelinus fontinalis.

Three generations of the brook trout (*Salvelinus fontinalis*) were exposed to several concentrations of total cadmium (0.06-6.4 mg Cd/liter). At concen-

trations of 3.4 mg Cd/liter, a significant number of first and second generation males died during spawning. The same concentration also greatly retarded growth of juvenile second- and third-generation offspring. The maximum acceptable toxicant concentration (MATC) for brook trout exposed to cadmium in Lake Superior water (hardness 44 mg/liter as CaCO₃, pH 7-8) occurs somewhere between 1.7 and 3.4 mg Cd/liter. Cadmium residue analyses of kidney, liver, gills, gonads, spleen, muscle, and red blood cells were made from first and second generation trout. Kidney, liver, and gill tissue accumulated the largest amounts of cadmium at each water exposure concentration. There was no significant increase in cadmium measured in edible muscle at any cadmium water concentration tested. Cadmium residues in kidney, liver, and gill tissue of fish from all exposure concentrations came to an equilibrium (mg Cd/g) tissue in both first and second generation trout after 20 weeks. There was a rapid loss of cadmium from gill tissue of second generation trout placed in control water for twelve weeks, but no loss was observed from the liver and kidney. (Spaeth-Wisconsin)
W78-01969

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE-REPRISE.
San Diego State Univ., CA.
For primary bibliographic entry see Field 5B.
W78-01970

FOOD HABITS OF CHANNEL CATFISH IN A RESERVOIR RECEIVING HEATED WATERS.
North Texas State Univ. Denton. Dept. of Biological Sciences.
D. L. McNeely, and W. D. Pearson.
Hydrobiologia, Vol. 52, p. 243-249, 1977. 1 fig, 4 tab, 16 ref.

Descriptors: *Channel catfish, *Thermal pollution, *Food habits, Heat, Texas, Seasonal, Reservoirs.
Identifiers: *Ictalurus punctatus, Dallas County(TX).

Food habits of channel catfish, *Ictalurus punctatus*, are studied in North Lake (Dallas County, TX), a 330 ha reservoir, which provides cooling water for a 700 Mw steam electric generating plant located at its northeast corner. Five sampling stations were established in littoral zones, one at the mouth of the canal which discharges heated water into the reservoir and the others in areas not directly affected by the effluent. Stomachs of 214 fish were removed and examined. During summer months, catfish captured at the mouth of the effluent canal contained more fish and less aquatic vegetation than catfish obtained at the other four stations. Calculated overlap indices indicated no significant differences between diets of catfish captured at the mouth of the effluent canal, compared to those captured at the other four locations during fall, winter and spring months. During the summer, catfish in the vicinity of the canal mouth were concentrated in cooler waters beneath the thermal plume. They appeared to feed primarily on fish and benthos, and where aquatic vegetation wasn't available. (Spaeth-Wisconsin)
W78-02001

THERMAL DISCHARGE FROM A NUCLEAR POWER PLANT: PREDICTED EFFECTS ON LAKE ERIE FISH.
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
J. M. Reutter, and C. E. Herdendorf.
The Ohio Journal of Science, Vol. 76, No. 1, p. 39-45, January 1976. 2 tab, 13 ref. Federal Aid in Fisheries Restoration F-41-R.

Descriptors: *Lake Erie, *Fish, *Thermal pollution, Effluent, Water pollution, Nuclear power-

plants, Water temperature, Water pollution sources, Ohio, Lakes, Fishkill.
Identifiers: *David-Besse Nuclear Power Station(Toledo OH).

Water from Lake Erie to be used in the closed condenser cooling system of the Davis-Besse Nuclear Power Station near Toledo, OH will be returned to the lake at a maximum of 11.1°C above ambient lake temperature. This effluent will be discharged from the lake bottom through a high velocity nozzle over a rockfill 305 m offshore. In this study fish were subjected to laboratory experiments to determine their seasonal final temperature preferences, effects of heat and cold shock, and Critical Thermal Maximum (CTM) for each species. The CTM is the temperature at which the fish loses locomotor control. The final temperature preferences of 24 species tested were above lake temperature during fall, winter, and spring, and about the same as lake temperature in summer, indicating an attraction or indifference to thermal plumes. The CTM of each of 33 species and one hybrid tested was well above the maximum plume temperature during late fall, winter, and early spring; during late spring, summer, and early fall the maximum plume temperature will be above or very close to the CTM of every species tested. About 92% of fish subjected to heat shocks above their CTM survived after return of ambient lake temperature. Sudden temperature change tests showed that the absolute temperature was more important than the size of the change. (Lynch-Wisconsin)
W78-02002

PLUTONIUM AND AMERICIUM: UPTAKE FROM CONTAMINATED SEDIMENTS BY THE POLYCHAETE NEREIS DIVERSICOLOR.
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
T. M. Beasley, and S. W. Fowler.
Marine Biology, Vol. 38, No. 2, p. 95-100, 1976. 1 tab, 16 ref.

Descriptors: *Worms, *Annelids, *Adsorption, *Nuclear waste, Sediments, Water pollution sources, Path of pollutants.
Identifiers: *Polychaete, *Nereis diversicolor, *Americium, *Plutonium, Bravo Crater(Marshall Islands), Bikini Atoll(Marshall Islands), Irish Sea(United Kingdom), Cumbrian coast(United Kingdom), Orme estuary(Northern France), Oustréham(Northern France).

Effects of plutonium and americium on the polychaete sandworm *Nereis diversicolor*, exposed to sediments contaminated through the testing of nuclear devices, or by release of liquid waste from a nuclear fuel reprocessing plant were examined. The sediment sample contaminated by nuclear device testing was collected from Bravo Crater at Bikini Atoll, Marshall Islands. The sediment sample contaminated by fuel reprocessing wastes was obtained from the Irish Sea, some 4.6 nautical miles north of the Windscale nuclear fuel reprocessing plant outfall, located on the Cumbrian coast of the United Kingdom. Worms were obtained from the mud flats of the Orme estuary near Oustréham in northern France. Uptake of both plutonium and americium was small in both sediments, usually about 0.5%. Uptake of plutonium was similar after 40 days in both sediments. There was a definite preferred uptake of plutonium over americium in each case. The americium 241 in the Windscale sediment appears more biologically available than that from the Bravo Crater sediment. These experiments and results of earlier studies support the tentative conclusion that water could be the predominant pathway for deposit-feeding worms like *Nereis diversicolor*. (Spaeth-Wisconsin)
W78-02003

THE INFLUENCE OF CRUDE OIL AND MIXTURES OF CRUDE OIL/DISPERSANTS ON THE ONTOGENIC DEVELOPMENT OF THE

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

BALTIC HERRING, CLUPEA HARENGUS MEMBRUS L.
Swedish Water and Air Pollution Research Lab.,
Nyköping, Baltic Sea Lab.
O. Lindén.
Ambio, Vol. 5, No. 3, p. 136-140, 1976. 8 fig, 1 tab, 17 ref.

Descriptors: *Emulsifiers, *Oil spills, Oil pollution, Water pollution effects, Herrings, Disasters, Fishkill, Embryonic growth stage, Cytological studies.
Identifiers: *Clupea harengus membrus L., *Finsol SC, *Finsol OSR-2, *BP 1100-X, *Fish embryo malformation, Finland, Torrey Canyon Oil Spill (1967).

Toxicity of crude oil as it affects the early development of Baltic herring increases several hundred-fold if the oil is mixed with one of two supposedly non-toxic oil spill dispersants developed since 1967; if a pre-1967 dispersant is used to emulsify the oil, the toxicity increases by an additional factor of ten. Effects of a Venezuelan light oil, either alone or dispersed by three different oil-spill dispersants, were tested on spring-spawning Clupea harengus membrus L. caught near the laboratory on the southwestern coast of Finland. Among laboratory-fertilized herring eggs exposed to a mixture of crude oil and Finsol OSR-2 (post-1967), strengths of 2.5, 25 and 250 ppm respectively caused 0.0, 10.1 and 19.2% embryo malformations. With BP 1100 X (also post-1967) at the same three mixture of strengths with crude oil, the respective embryo malformation rates were 0.0, 13.6 and 15.4%. But when the pre-1967 dispersant, Finsol SC, was applied with the crude oil to the fish eggs at 25 ppm, the embryo malformation rate rose to 94.6%. Crude oil alone at its highest tested concentration caused a malformation rate of 16.4%. In addition to these observations, studies were made of effects on hatching percentages, embryonic movements and embryonic heart beat. It is concluded that the use of an oil-spill dispersant may substantially aggravate the deleterious effects of the oil; moreover, use of the more recently developed 'non-toxic' dispersants does not seem to substantially alleviate the toxicity associated with highly-toxic dispersants used with catastrophic biological effects on oil spilled from the Torrey Canyon tanker disaster in 1967. (Spaeth-Wisconsin)
W78-02005

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I., FLORA AND CHEMISTRY.
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker.
Arch. Hydrobiol., Vol. 78, No. 3, September 1976, p. 396-412. 5 fig, 4 tab, 45 ref.

Descriptors: *Aquatic weed control, *Herbicides, *Dalapon, *2,4-D, Environmental effects, Biomass, Productivity.
Identifiers: *Phragmites communis, Bradwell Brook, Essex, England, Dengie Peninsula, England, Floating macrophytes, Epilic algae, England.

The first of a two-paper series describes a field experiment to compare ecological effects using herbicides for drainage channel maintenance, and the conventional method of hand clearance. Experimental sites were established January 1973 on Bradwell Brook, Essex, England, a land drainage channel, with a summer base flow, draining 16.2 sq km of agricultural land on the Dengie Peninsula. Autumn application of dalapon (25 kg/ha) succeeded in controlling growth of Phragmites communis, and application of dalapon (12 kg) and 2,4-D (1 kg) in the following spring restricted the growth of ditchbank vegetation. The maximum mean concentration of herbicide recorded in the experimental reach was from 29 mg/l for 2,4-D to 117 mg/l for

dalapon. At each herbicide application it was calculated that the minimum mass of herbicide lost downstream from the experimental reach was less than 0.01% of the herbicide used. When herbicide application was used to control Phragmites, there was a development of replacement plant forms such as planktonic and epilic algae and submerged and floating macrophytes. The changes correlated with changes in the light climate in the experimental reach. Some of the changes in water chemistry (i.e. SiO₂ and O₂) were correlated with changes in the dominant plant form. Estimates were made of the biomass and net productivity of the macrophytes. (Spaeth-Wisconsin)
W78-02007

RELATIVE IMPORTANCE OF FUNGI AND BACTERIA IN THE DECOMPOSITION OF PHRAGMITES LEAVES.
University of East Anglia, Norwich (England). School of Biological Sciences.
C. F. Mason.
Hydrobiologia, Vol. 51, No. 1, p. 65-69, 1976. 4 tab, 1 ref.

Descriptors: *Bacteria, *Fungi, *Decomposing organic matter, Metabolism, Respiration, Fungicides, Bactericides.
Identifiers: *Phragmites communis, Alderfen Broad (Norfolk Eng.), Nystatin, Actidione, Benzylpenicillin, Streptomycin.

This study examines the relative importance of bacteria and fungi in the decomposition of Phragmites communis leaves in Alderfen Broad (Norfolk, Eng.). Leaves were collected in spring from the previous season's growth of Phragmites, and were placed in 20 mesh bags in the water at the edge of the lake. After 35 and again after 122 days 10 bags each were removed to the laboratory and treated with the antifungal agents nystatin and actidione, and the antibacterial agents benzylpenicillin and streptomycin sulphate. In this study bacteria were as important as fungi in both weight loss and respiration of dead Phragmites leaves after 35 days. At 122 days fungi accounted for very little of the litter respiration, whereas the importance of bacteria had increased. Overall community metabolism had not changed in this period; populations of both organisms had decreased, with fungi decreasing more than bacteria. It is postulated that in advanced stages of decomposition the substrate is no longer suitable for the growth of fungi. After antibiotics were applied there was a large residual respiration and weight loss of tissue. Population counts showed that bacterial and fungal populations were reduced by over 90%. Periphytic algae, protozoa, and nematodes were probably responsible for metabolic activity not suppressed by the antibiotics. (Lynch-Wisconsin)
W78-02019

THE SEAGRASSES IN THE WADDEN SEA, (IN DUTCH).
For primary bibliographic entry see Field 2L.
W78-02045

AN EXAMPLE FROM THE WESER: CHANGES IN THE BLOOD COUNT OF FISH EXPOSED TO HIGHER CONCENTRATIONS OF POTASSIUM (AM BEISPIEL DER WESER: VERAENDERUNGEN IM BLUTBILD DER FISCH BEI HOEHEREN KALIUMKONZENTRATIONEN).
For primary bibliographic entry see Field 5A.
W78-02063

DAMAGING ACTION OF WATER POLLUTANTS TO DAPHNIA MAGNA (BEFUNDE DER SCHADWIRKUNG WASSERGEFAEHRDENDER STOFFE GEGEN DAPHNIA MAGNA).
Vienna Univ. (Austria). Inst. fuer Analytisches Chemie.
G. Bringmann, and R. Kuehn.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 10, No. 5, p. 161-166, 1977. 1 tab.

Descriptors: *Toxicity, *Bioassay, Environmental effects, *Daphnia, Aquatic life, Lethal limit, Heavy metals, Organic wastes, *Water pollution effects, Waste water treatment, *Pollutant identification.

A standardized procedure with 24-hr-old animals from a clone of Daphnia magna was used to determine the concentrations of 173 substances hazardous in water at which 0%, 50%, and 100% mortality would occur. The tests were conducted with tap water which was free from chlorine, saturated with respect to dissolved oxygen, and had a hardness of 16 deg (German), pH of 7.6-7.7, and temperature of 20-22°C. Within the concentration range of 0.001 to less than 0.1 mg/liter for hydroquinone, silver, mercury, and copper and of 0.1-1.0 mg/liter for aniline, hydrazine hydroxide, Cd, and CN, 50% mortality was observed. Concentrations in the range of 1-10 mg/liter were necessary to produce 50% mortality with Cr, Tl, Pb, S, 2-ethyl hexyl amine, 2,3-dinitro toluene, salicyl aldehyde, m-cresol, 4,6-dinitro-o-cresol, and benzyl chloride. The majority of the 173 compounds produced 50% mortality at concentrations ranging from 10-1000 mg/liter. (Schulz-FIRL)
W78-02067

THE TOXICITY OF FOOD PROCESSING EFFLUENTS TO FISH.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
D. W. Bisset.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p. 257-272. 1 fig, 6 tab, 4 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Toxicity, *Bioassay, *Fish, *Effluents, *Food processing industry, Potatoes, Poultry, Dairy industry, Canneries, Aquatic life, Environmental effects, Industrial wastes, Waste water disposal, Food processing effluent toxicity.

Results of an extensive program conducted by the Canadian Environmental Protection Service to evaluate the toxicity of industrial effluents, specifically those generated by the food processing industry, are presented. Testing procedures which have been standardized by the Environmental Protection Service for determinations of the LC(50) or the concentration of a particular substance which results in 50% mortality in rainbow trout are described. Results of toxicity studies are presented for five types of food processing effluents: potato processing, meat and poultry products, dairy products, fruit and vegetable processing, and associated industries. LC(50) values, BOD, TSS, type of effluent sample, and type of waste water treatment are presented for a variety of subdivisions of food processing categories. The toxicity studies will be used in preparation of a series of effluent guidelines for the food processing industry. (See also W78-02070) (Schulz-FIRL)
W78-02081

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES.
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
G. S. Braek, A. Jensen, and A. Mohus.
Journal of Experimental and Marine Biology Ecology, Vol. 25, No. 1, p. 37-50, November, 1976. 8 fig, 5 tab, 12 ref.

Descriptors: *Copper, *Zinc, *Algae, Phytoplankton, Heavy metals, Diatoms, Dinoflagellates, Marine algae, Fjords, Phaeodactylum tricornutum, Thalassiosira pseudonana, Skeletonema costatum, Amphidinium carterii.

Very few studies deal with the combined toxic effects of two or more heavy metals on algae,

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despite the fact that heavy metals almost always interact in natural waters. This study describes combined effects of copper and zinc ions on the growth of three marine diatoms (*Phaeodactylum tricornutum*, *Thalassiosira pseudonana*, and *Skeletonema costatum*) and one dinoflagellate (*Amphidinium carterii*). According to previous research, there are three types of joint action of toxicants: (1) independent joint action, (2) similar joint action, and (3) synergistic action. This study shows that joint effects of copper and zinc on phytoplankton cannot be predicted on the basis of the toxicity of the individual metals. A. carterii and T. pseudonana illustrate clear cases of synergism, while an antagonistic effect was observed toward P. tricornutum. In the latter case, addition of zinc ions reduces the inhibition of growth by the more toxic copper ions. Zinc toxicity to this alga increases at low concentration of magnesium, indicating a common route for divalent metal ions. In the case of S. costatum it is evident that the effect of the metals in combination is greater than the sum of the effects of the metals applied separately. However the latter results are not as clear-cut as the results obtained with the other algae due to the sensitivity of S. costatum to copper. Addition of copper and zinc separately or in combination does not result in clearly extended lag phases in these experiments. (See also W74-11329) (Lynch-Wisconsin)

W78-02121

WISCONSIN DESMIDS. III. DESMID COMMUNITY COMPOSITION AND DISTRIBUTION IN RELATION TO LAKE TYPE AND WATER CHEMISTRY.

Wisconsin Univ.-Madison. Dept. of Botany. W. J. Woelkerling, and S. B. Gough. Hydrobiologia, Vol 51, No 1, p 3-32, 1976. 2 fig, 13 tab, 17 ref. WDNT-133-9129, 133-9847. WARF-140374.

Descriptors: *Wisconsin, *Biological communities, *Lakes, *Bogs, Chlorophyta, Frequency, Density, Distribution, Water chemistry, *Desmids, *Aufwuchs, Staurastrum, Cosmarium, Closterium, Macrophytes, Euplankton.

Data on the generic composition of the euplankton community of 49 Wisconsin lakes and the aufwuchs desmid communities of 61 Wisconsin lakes were studied. The role of the various genera were analyzed in terms of: (1) frequency, density, and relative importance, (2) the suitability of various lake types as a habitat for desmid communities, and (3) the correlation between chemical parameters and desmid distribution. The five types of lakes studied for the euplankton were spring ponds, hard water lakes, soft water lakes, acid bogs and alkaline bogs. The aufwuchs were also studied in closed bogs, and aufwuchs communities of 107 macrophyte hosts were analyzed. The genera Staurastrum, Cosmarium, and Closterium occur widely, appear to have major roles in the communities of all lake types, and are extremely tolerant of varied chemical conditions. Most euplankton genera are only important in acid bogs but aufwuchs genera are usually more widely distributed. Both the euplankton and aufwuchs communities appear to contain 1-4 desmid assemblages, each with a different range of importance values. Using biological criteria, acid bogs seem the most suitable lake type for desmid communities, while calcareous spring ponds appear least suitable. High generic diversity of desmids can be correlated with low conductivity, calcium and alkalinity levels, pH values of 5.1 to 7.0, and the presence of free CO₂. (Spaeth-Wisconsin)

W78-02122

PHYCOLOGICAL NOTES IV. SUCCESSIVE WATER BLOOMS OF FOUR GREEN ALGAE, Slippery Rock State Coll., PA. Dept. of Biology. P. A. Archibald, and H. C. Bold. The Texas Journal of Science, Vol 27, No 3, p 353-360, September, 1976. 16 fig, 7 ref.

Descriptors: *Eutrophication, *Ponds, *Chlorophyta, Texas, Systematics. Identifiers: *Euglena granulata (Klebs), Schmitz, *Chlamydomonas incerta Pascher var. medio-stigma var. nov., *Chlorogonium sp., *Nautococcus emersus Geitler.

Water blooms of *Euglena granulata*, *Chlamydomonas incerta* var. *medio-stigma* var. nov., *Chlorogonium* sp., and a species tentatively identified as *Nautococcus emersus* (Chlorophyceae), appeared successively on three lily ponds on the campus of the University of Texas at Austin. The species were studied from fresh collections, and unialgal cultures were made. Brief taxonomic descriptions are given. *E. granulata* bloomed from December 1965 through January 1966, and at the same time in 1966-1967 in one of the ponds. A species tentatively identified as *N. emersus* appeared during November 1973, when repairs and a water bloom of *Wolffella* in one pond made it necessary to turn off the flowing water source. The *Nautococcus* bloom appeared soon after the water flow had stopped, and after the water level of the ponds had fallen through leakage and evaporation. This record appears new for the United States. The bloom of *N. emersus* was dissipated by heavy rain, and followed by several weeks where water was again allowed to flow through the ponds, and then stopped again for repairs. *Chlorogonium* sp. appeared as water flow ceased in December 1973. *C. inserta* occurred in one pond in January 1974, after heavy rains dissipated the bloom of *Chlorogonium*. It agreed in all morphological characteristics with *C. inserta* Pascher, except for the position of the stigma, which is medial, and not anterior. It is described as a new variety. (See also W74-06760) (Spaeth-Wisconsin)

W78-02123

REMARKS, REGION IX, Environmental Protection Agency, San Francisco, CA. Region IX. For primary bibliographic entry see Field 5A. W78-02178

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION, (VOLUME 2), National Marine Fisheries Service, Panama City, FL. Panama City Lab.; and National Marine Fisheries Service, Panama City, FL. Gulf Coastal Fisheries Center. C. H. Saloman.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 423. Price codes: A24 in paper copy, A01 in microfiche. June 30, 1974. 556 p.

Descriptors: *Aquatic animals, *Benthic fauna, *Invertebrates, *Dredging, *Beach erosion, *Erosion control, Shores, Littoral, Gulf of Mexico, Florida, Estuaries, Gulfs, Annelids, Nematodes, Erosion, Siltation, Turbidity, Beaches, *Sand Key (Fla), *Treasure Island (Fla), Polychaetes, Pinellas Co (Fla).

Each erosion from severe storms along the gulf shores of Pinellas Co., Florida has long been a problem. Normal wave action between storms only partially restores the beaches, and hydraulic dredging is necessary for beach restoration. This study defines characteristics of the Sand Key and Treasure Island littoral to gauge the environmental effects of the proposed dredging. Vol. II includes Part IX, Benthic Invertebrates; Part X, Effects of Hydraulic Dredging for Restoration of Sunset Beach; Part XI, Selected References (269 pp.); and Part XII, Summary and Recommendations. Samples of benthic animals were collected between January and December 1971. Twenty-six transect lines were established, each with 8 stations ranging from the beach to 640 m offshore. Thirty-nine major taxa were collected; the most abundant

were polychaetes (31.3%), nematodes (17.2%), pelecypods (10.9%), amphipods (8.6%), gastropods (6.7%), and nemertean (5.4%). Extensive tables accompany this section. On 19 June 1972 Hurricane Agnes caused serious beach erosion on the southern end of Treasure Island (Sunset Beach). Hydraulic dredging was begun in October 1972 to restore the beach; the creation of offshore borrow pits affected the habitat. Turbidity increased, and abundance and diversity of benthic animals decreased, due especially to siltation. Fish numbers and diversity increased slightly. Recommendations for sources of sand and for optimal dredging times and methods are given. (See also W76-03177) (Lynch-Wisconsin)

W78-02180

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER, Waterloovonding Lab., Delft (Netherlands). J. H. G. Verhagen, J. C. H. Peeters, and R. Peelen. Publication No 151, November 1975. Paper presented at the XVI LAHR Congress, Sao Paulo, Brazil, July 1975, 8 p. 2 fig, 2 tab, 3 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Algae, Phosphorus, Eutrophication, Trophic level, Lakes, *Brielse Meer (Netherlands), *Ditrozo phytoplankton-zooplankton-nutrient model, Plankton dynamics, Vertical transport, Hydraulic longitudinal transport, Retention time.

The ditrozo phytoplankton-zooplankton-nutrient model is applied to data from the Brielse Meer, a hypertrophic lake in the delta of the rivers Rhine and Meuse in the southwestern part of the Netherlands. A 30-month experiment, was carried out to diminish the P-load in the lake by dephosphatizing inlet river water. Mathematical modelling was used to support field work and evaluate results. Discrepancies between model results and field observations are analyzed and points of general interest on developing ecological models are discussed. Evaluation of results suggests that vertical migration of phytoplankton, especially the blue green species, is an important mechanism in the plankton dynamics of a shallow turbid lake. Also, unrealistic zooplankton response is a result of the model being over-simplified. The model does not distinguish between phytoplankton species and zooplankton species. Lack of appropriate food in fact inhibits excessive growth of zooplankton predicted by the model. (Coyle-Wisconsin)

W78-02183

COMPETITIVE INHIBITION FOR AMINO ACID UPTAKE BY THE INDIGENOUS MICROFLORA OF UPPER KLAMATH LAKE, British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology. B. K. Burnison, and R. Y. Morita. Appl Microbiol. 25(1), p 103-106, 1973.

Descriptors: *Amino-acid, Carbon-14, *Eutrophication, Flora, *Inhibition, *Klamath Lake (Ore), Lakes, *Absorption, *Microflora, Oregon.

The uptake of a specific ¹⁴C-amino acid by the heterotrophic microorganisms in the epilimnion of an eutrophic lake (Klamath Lake, Oregon) was influenced by the presence of other amino acids. The effect of unlabeled serine on ¹⁴C-glycine uptake was caused by competitive inhibition, which changed the interpretation of the kinetic parameters, the turnover time, T₁, and the sum of a transport constant, (K_t + S_n), and the natural substrate concentration. The maximum velocity of uptake, V_{max}, is unaffected by the competitive inhibition. —Copyright 1973, Biological Abstracts, Inc.

W78-02187

COLLABORATIVE TESTS OF WATER ANALYSIS (THE CHEMAQUA PROGRAMME), Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

For primary bibliographic entry see Field 5A.
W78-02188

NITROGEN FIXATION IN SALT MARSHES - A BUILT-IN PLANT FERTILIZER,
Hampshire Coll., Amherst, MA.
C. D. Van Raalte.
Oceonus, Vol 20, No 2, p 58-63, Summer 1977. 5 fig, 2 tab, 12 ref.

Descriptors: *Limiting factors, *Nitrogen, *Nitrogen fixation, *Salt marshes, Phosphate, Algae, Nitrogen fixing bacteria, Massachusetts, *Spartina alterniflora, *Digitaria, *Great Sippewissett Marsh(MA), Ammonia nitrogen, Algal mats.

The structure of salt marsh ecosystems and the effect of pollutants on them has attracted the interest of agricultural researchers looking for ways to maintain crop yields while reducing nitrogen requirements. The present research, of nitrogen fixation in such an ecosystem, studied a salt marsh cord grass, *Spartina alterniflora*. The grass root: fix nitrogen at high rates and the bacterial symbiont in the root is similar to that of *Digitaria* (crab grass). These studies, in the Great Sippewissett Marsh on Cape Cod in Massachusetts, found that in plots fertilized with sewage sludge and in plots fertilized only with nitrogen, marsh grass grew taller, looked greener, and was higher in nitrogen. There was no change in plots fertilized only with phosphate. It was presumed that nitrogen fixation must be important in salt marshes. In fact fixation rates were very high. Several years of study have produced a better understanding of nitrogen fixation in salt marshes, with major fixation sites identified and seasonal rates and environmental factors determining those rates determined. (Coyle-Wisconsin)
W78-02193

THE INTERACTION OF COMPONENTS CONTROLLING NET PHYTOPLANKTON PHOTOSYNTHESIS IN A WELL-MIXED LAKE (LOUGH NEAGH, NORTHERN IRELAND),
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.
D. H. Jewson.
Freshwater Biology, Vol. 6, No. 6, p. 551-576, 1976. 18 fig, 1 tab, 71 ref.

Descriptors: *Phytoplankton, *Photosynthesis, *Solar radiation, *Mixing, Lakes, Euphotic zone, Chlorophyll, Water temperature, Diatoms, Algae, Stratification, Turbidity, Seasonal, Cyanophyta, Standing crops, *Lough Neagh(Northern Ireland), Oscillatoria redekei, Oscillatoria agardhii, Melosira italica, Stephanodiscus astraea, Gross photosynthesis.

Control of gross photosynthesis of phytoplankton per unit area by (1) photosynthetic capacity, (2) phytoplankton content of the euphotic zone, and (3) the effective radiation input was studied in Lough Neagh, Northern Ireland, a shallow lake (mean depth 8.6 m) having the advantage of a well-mixed water column most of the year. Phytoplankton in a turbid lake is likely to be circulated into dark zones for long periods. Limits to growth caused by this mixing are assessed. Measurements of photosynthesis were made by the light and dark bottle method using Winkler oxygen determinations. Variations in photosynthetic capacity is governed largely by changes in temperature. Bluegreen algae were the dominant phytoplankton; important species were *Oscillatoria redekei* and *O. agardhii*. Spring diatom growths consisted mainly of *Melosira italica* and *Stephanodiscus astraea*. The two sites analyzed, the open lake and Kinneigh Bay, had standing crops of up to 90 and 300 mg chlorophyll a/cu m respectively, and maximum daily rates of gross integral photosynthesis of 11.7 and 15.6 g O₂/sq s/day. Nonalgal sources were responsible for much light attenuation, especially at low standing crops in winter when integral

photosynthesis decreased to 0.5 g O₂/sq m/day. This is the result of self-shading of the phytoplankton which alters crop content of the euphotic zone at different population densities. Changes in the irradiance function are largely responsible for the changes in daily rates of integral gross photosynthesis. (Lynch-Wisconsin)
W78-02195

ALGAL RECOLONIZATION OF SOME CLEARED SUBTIDAL AREAS,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
J. M. Kain.
The Journal of Ecology, Vol. 63, No. 3, p. 739-765, 1975. 6 fig, 11 tab, 53 ref.

Descriptors: *Algae, *Succession, *Seasonal, *Intertidal areas, Fluctuations, Depth, Biomass, Dominant organisms, *Recolonization, *Subtidal zone, Rhodophyceae, Phaeophyceae, Chlorophyceae, Port Erin, England, Isle of Man, Laminaria hyperborea forest, Saccorhiza polyschides.

Algal succession in a cleared subtidal environment was examined. Two groups of concrete blocks, at 0.8 and 4.4 meters below extreme low water, forming a ruined breakwater at Port Erin, Isle of Man, were manually cleared of virgin *Laminaria hyperborea* forest for five years at four seasons. These were then sampled from 0.25 sq m quadrats, usually at three month intervals. November-cleared blocks showed *Saccorhiza polyschides* dominant by the end of the first summer, *L. hyperborea* dominant after two years, and a return to a virgin forest after three years. There was a similar sequence with blocks cleared in February and June, with peak biomass in late summer. *Saccorhiza* was almost excluded and *L. hyperborea* dominance resulted earlier, in shallow water, on blocks cleared in August. Recolonization was more variable and slower on deeper blocks. When a single block at 1.3 meters was cleared repeatedly every two months for eighteen months, 41 species arose. Rhodophyceae contributed the most biomass in the winter, Phaeophyceae in the spring, and Chlorophyceae in late summer. Winter-sporing species arose throughout the year, except on sterilized stones placed in the sea for the same two month period. Annual dry matter production was lower on cleared areas than in virgin forest. (Spaeth-Wisconsin)
W78-02196

FACTORS RELATED TO THE DISTRIBUTION OF MICROBIAL BIOMASS IN SALT-MARSH CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
C. W. Erckenbrecher, and L. H. Stevenson.
Marine Biology, Vol. 40, No. 2, p. 121-215, 1977. 1 fig, 6 tab, 6 ref. NG-33-73.

Descriptors: *Tidal effects, *Microorganisms, *South Carolina, Streams, *Biomass, Estuaries, Carbon, Bacteria, Regression analysis, *Distribution.

Ten physical-chemical factors were analyzed to assess the influence of ebb and flood tides on microbial biomass in salt marsh creeks, including changes in community characteristics. Two creeks near Georgetown, SC, were sampled over five separate tidal cycles. Variables were time, depth, temperature, velocity, salinity, dissolved oxygen (DO), pH, bacteria, adenosine triphosphate (ATP), and particulate organic carbon (POC). Although several significant correlations were noted between some of the variables, correlations coefficients were generally small. The highest value involving biological factors was 0.65, between POC and bacteria. Only when multiple regression analysis was used could more than 90% of the variability be accounted for. It was clearly demonstrated that water entering creeks during a

flooding tide was characterized by a lack of relationships between variables, while significant relationships were found for ebb-tide water. This greater number of significant relationships, especially bacteria to carbon, is thought to reflect the influence of sediment properties. POC was important only during an ebb tide, and accounted for 55% and 63% of the variability in ATP and bacteria. (Lynch-Wisconsin)
W78-02197

KINETICS OF PHOSPHATE LIMITED ALGAL GROWTH,
Technical Univ. of Denmark, Lyngby. Dept. of Applied Biochemistry.
N. Nyholm.
Biotechnology and Bioengineering, Vol. 19, No. 4, p. 467-492, April 1977. 12 fig, 4 tab, 33 ref.

Descriptors: *Algae, *Chlorophyta, Phytoplankton, Laboratory equipment, Laboratory tests, *Chlorella pyrenoidosa, *Selenastrum capricornutum, *Michaelis-Menton kinetics, Kinetic models, Phosphate concentrations, Phosphorus deficiency.

Growth kinetics of two green algae, *Chlorella pyrenoidosa* and *Selenastrum capricornutum*, were investigated under phosphate limitation and with continuous light at saturation intensities. Nine kinetic models which express specific growth rate as a function of the intracellular phosphorus content were examined and one, the principles of which were described in earlier research, was found useful in predicting transient growth responses to smaller perturbations of the chemostat and can be utilized as a general growth model for phosphate limited phytoplankton. Kinetics of phosphate uptake were investigated by adding pulses of phosphate to chemostats. Uptake by phosphorus deficient cells could be described by Michaelis-Menten kinetics for phosphate concentrations below 500 µg P/liter. Transition from limiting to nonlimiting conditions is described in the model as a discontinuous adjustment of the uptake rate. Because the uptake is rarely a rate-controlling step, this approximation has negligible influence on the model behavior in most cases. (Coyle-Wisconsin)
W78-02198

PRIMARY PRODUCTIVITY AND FISH YIELDS IN TROPICAL LAKES,
Duke Univ., Durham, NC. Dept. of Zoology.
J. M. Melack.

Transactions of the American Fisheries Society, Vol. 105, No. 5, p. 575-580, September, 1976. 1 fig, 1 tab, 53 ref. NSF GB 8328X.

Descriptors: *Fish harvest, *Regression analysis, *Primary productivity, Statistics, Phytoplankton, Yield equation, Photosynthesis, Homogeneity, *African lakes, *Indian lakes, Gross photosynthesis, Morphoedaphic index.

Analysis of the relationship between fish yields and phytoplankton productivity in tropical African and Indian lakes shows that commercial fish yields increase logarithmically as primary productivity increases arithmetically. A regression equation is developed to describe the relation between fish yields (FY) and gross photosynthesis (PG). The equation for eight African lakes is $\log FY = 0.113 PB + 0.91$ (with a coefficient of determination of 0.57). The African relationship is corroborated by the regression equation developed for 15 tropical Indian lakes: $FY = 0.122 PG + 0.95$. However, data-based uncertainties are cited: (1) When estimates of primary productivity made at a few stations several times in one year are converted to an annual estimate, lakewide average errors are exaggerated; (2) Commercial catch records may indicate fishing effort and not potential yield; (3) Catch records may apply only to one part of the lake. While this type of analysis shows promise as a method for assessing a fishery potential, more lakes with better data should be included in the

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studies before management decisions are based on estimates to primary productivity measurements. (Spaeth-Wisconsin)
W78-02199

EFFECT OF SUSPENDED PARTICLES AND THEIR SIZES ON NITRIFICATION IN SURFACE WATER.

Pahlavi Univ., Shiraz (Iran).
For primary bibliographic entry see Field 5B.
W78-02200

5D. Waste Treatment Processes

AIR AND LIGHT IMPERVIOUS WATER PURIFICATION AND PRODUCT DISPENSING SYSTEM.

For primary bibliographic entry see Field 5F.
W78-01701

CONTROLLING INDUSTRIAL WATER POLLUTION—PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).

Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-01718

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.

For primary bibliographic entry see Field 5F.
W78-01833

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES.

Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
For primary bibliographic entry see Field 5A.
W78-01854

TECHNICAL MANUAL FOR PROCESS SAMPLING STRATEGIES FOR ORGANIC MATERIALS.

Monsanto Research Corp., Dayton, OH.
For primary bibliographic entry see Field 5A.
W78-01857

REMOVAL OF CADMIUM ION FROM AQUEOUS SOLUTION.

Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.
J. Chou, and Y. Okamoto.
Journal Water Pollution Control, Vol. 48, No. 12, p. 2747-2753, December 1976. 5 fig, 3 tab, 23 ref.
OWRT 14-30-3150.

Descriptors: *Cadmium, *Foam fractionation, *Surfactants, Foam separation, Human diseases, Human pathology, Ions, Chelation, Sulfonates, *Waste water treatment, Water treatment, Polyalkylenepolyamines, 4-dodecyl-diethylenetriamine, Dodecylbenzyl-triethylenetriamine, Sodium dodecyl benzene sulfonate.

Removal of cadmium ion from aqueous solution by foam separation using chelating surfactants was investigated under various conditions. Cadmium has been linked with several diseases in humans, including hypertension, emphysema, and chronic bronchitis. Foam fractionation is the partial separation of a dissolved or colloidal substance (colligend) from a liquid by adsorption on the surface of bubbles which, upon rising, form a foam. The method works even with very dilute solutions. The chelating surfactants used were 4-dodecyl-diethylenetriamine and dodecylbenzyl-triethylenetriamine, and for comparison, the commercial surfactant sodium dodecyl benzene sulfonate (ABS). With ABS cadmium ion could

not be removed from a pure aqueous CdCl₂ solution, but using an anionic surfactant, cadmium could not be removed from solutions containing a large excess of other metallic ions such as sodium, calcium, and magnesium which compete in electrical attraction. On the other hand, 4-dodecyl-diethylenetriamine removed cadmium ion from similar solutions. For both polyalkylenepolyamine surfactants, cadmium removal increased with pH increase up to an optimum of 7-10. In terms of ultimate removal, gas flow rates of 150 and 200 cu cm/min were more effective than 300 cu cm/min. The effects of surfactant and cadmium concentration were also analyzed. (Lynch-Wisconsin)
W78-01913

THE TREATMENT AND ANALYSIS OF CYANIDE WASTEWATER.

Thiokol Corp., Brigham City, UT. Wasatch Div.
D. P. Clark, L. W. Poulter, O. W. Wilson, and W. N. Christenson.

Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-006 394, Price codes: A06 in paper copy, A01 in microfiche. Report No. AFCEC-TR-74-5, February 1975. 111 p, 25 fig, 31 tab, 1 append.

Descriptors: *Nitrogen compounds, *Chlorination, *Industrial wastes, *Electrochemistry, Hydrogen ion concentration, Chemical reactions, Electrolytes, Design data, *Waste water treatment, Pollutant identification, Cyanide, Chlorine generation, Electrolytic cells, Electroplating wastes.

A significant volume of cyanide-bearing waste water is generated at electroplating facilities used by the Air Force in its aircraft maintenance program. Problems associated with the alkaline chlorination process which has been used in the past to treat cyanide-bearing waste water include chlorine gas leaks, sensor probe failure, carbonate scaling, and the high cost of chemical raw materials. The Thiokol waste treatment process was developed in response to the need for a system to destroy cyanide materials at lower operating costs, without operational problems and in compliance with new federal regulations governing the levels of cyanide in effluents. The system includes an electrolytic cell to generate chlorine in the waste water. Since an equivalent number of hydroxyl ions are generated at the anode of the electrode, no pH adjustment is required during use of the system. Alternate methods for cyanide destruction are reviewed, including ion exchange, adsorption, reverse osmosis, integrated systems, and electrolytic decomposition. Design data for a prototype Thiokol system are presented for the process pump, salt feeder, chlorination tank, recycle pump, electrolytic cell, and settling tank. (Schulz-FIRL)
W78-02021

RECLAMATION OF METAL VALUES FROM METAL-FINISHING WASTE TREATMENT SLUDGES.

Battelle Columbus Labs., OH.
A. B. Tripler, Jr., R. H. Cherry, Jr., and G. R. Smithson, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 018, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-018, April 1975. 87 p, 8 fig, 17 tab, 60 ref, 5 append.

Descriptors: *Metals, *Copper, *Nickel, *Chromium, *Electrochemistry, Leaching, Heavy metals, Sludge treatment, Costs, Reviews, Electrolysis, Sludge treatment, Sludge disposal, On-site data collections, Industrial wastes, *Waste water treatment, Metal-finishing sludges, Metals recovery.

The specific objectives of this project were acquiring data on the quantity and characteristics of metal sludges produced in the United States,

evaluating existing treatment and recovery techniques used with metal sludges, developing new recovery techniques, and examining the effects of weathering on stored sludge. Results of a literature search, a plant survey, and field studies to augment information obtained from the previously mentioned sources and to collect sludge samples for laboratory studies are presented. Laboratory experiments were conducted to examine the leachability of metals from dried sludge samples from seven electroplating plants. Processes which were evaluated for the recovery of copper and nickel included electrowinning, cementation, and liquid ion exchange. Details of experiments with the electrolysis of ammonium carbonate leach solutions in a three-compartment cell are presented. Economic studies were conducted to estimate costs for small-scale processing of metal sludges to recover copper, nickel, and chromium. (Schulz-FIRL)
W78-02022

REMOVAL OF CHROMIUM FROM PLATING RINSE WATER USING ACTIVATED CARBON.

Battelle Columbus Labs., OH.

R. B. Landrigan, and J. B. Halliwell.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 370, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-055, June 1975. 43 p, 10 fig, 6 tab, 4 append.

Descriptors: *Chromium, *Activated carbon, *Adsorption, *Chelation, *Separation techniques, Costs, Chemical reactions, Industrial wastes, Waste assimilative capacity, Pilot plants, Recycling, *Waste water treatment.

Pilot plant and laboratory studies were conducted to evaluate the use of an activated carbon system for removal of chromium from rinse waters in a plating plant and to compare acid and caustic stripping for removal of chromium from the activated carbon. The studies concluded that activated carbon treatment was applicable to rinse water solutions with chromium concentrations of up to 600 mg/liter, and perhaps higher. Chromium could then be desorbed from the activated carbon in a four-stage process. The desorption process includes wetting of the carbon with a 20% sodium hydroxide-500 ppm chelating agent solution, exposing the carbon to air for 18 hrs. washing with a 20% sodium hydroxide solution, rinsing with water, and washing with a sulfuric acid solution. More than 90% of the adsorbed chromium was removed during the caustic-aeration and water rinse steps of the desorption process. Studies on the adsorption capacity of activated carbon indicated that 22 lbs of chromium was adsorbed per 200 lbs of carbon in one cycle. Capital costs for a system designed to treat 20 gpm of rinse water containing 100 ppm of hexavalent chromium were estimated at \$35,800 with an estimated daily total operating cost of \$62.60. (Schulz-FIRL)
W78-02023

DESIGN AND EVALUATION OF AN OILY WASTES DISPOSAL SYSTEM FOR RED RIVER ARMY DEPOT.

DARCOM Intern Training Center, Texarkana, TX.

F. W. Crouse, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 729, Price codes: A05 in paper copy, A01 in microfiche. Report No. DARCOM-ITC-02-08-76-003, April 1976. 85 p, 11 fig, 15 tab.

Descriptors: *Oil wastes, *Oily water, *Water quality standards, *Waste disposal, Oxidation lagoons, Separation techniques, Sludge disposal, Industrial wastes, *Waste water treatment, Oil wastes disposal.

The EPA's requirement of a maximum concentration of 5 ppm of oil in effluent leaving the Red

River Army Depot (RRAD) in Texarkana, Texas, resulted in a project to design and evaluate an oily wastes disposal system for waste petroleum oils and lubricants (POL's). Current disposal practices for POL's include collection of some of the waste oils in 55-gal drums for sale to private contractors, with the remainder discharged to drainage ditches for collection in a large lagoon. The skimming system for removal of oil from the lagoon proved inadequate for EPA's requirements. A program was initiated to develop a system for RRAD which could be used as a general design for oil collection at military installations throughout the United States. The program included a sampling system to characterize wastes at RRAD, which indicated that the average oil content of effluent leaving the lagoon was 12 ppm. Various methods of primary, secondary, and tertiary treatment for oil wastes were considered. The treatment method chosen for separation of oil and water at RRAD included the construction of a 3.4-million-gal basin with an average storage level of 1.1 million gal to accommodate expected heavy yearly rainfalls in the area. Combustion in the depot's boilers was chosen as the means of oil disposal. (Schulz-FIRL) W78-02024

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX), Kappalaverket, Lidings (Sweden). For primary bibliographic entry see Field 5E. W78-02025

THE USE OF HOLLOW-FIBER MEMBRANES IN REVERSE OSMOSIS (UTILISATION DES MEMBRANES EN FIBRES CREUSES DANS L'OSMOSE INVERSE), R. B. Davis, M. J. Coplan, A. E. Allegrezza, Jr., and R. D. Bruchsky. Informations Chimie, No. 163, p 171-174, January-February, 1977. 5 fig, 2 tab.

Descriptors: *Membrane processes, *Reverse osmosis, *Tertiary treatment, *Separation techniques, *Permeable membranes, Filtration, Filters, Nitrogen compounds, Salts, Zinc, Industrial wastes, *Waste water treatment, Ultrafiltration.

The terms macrofiltration, microfiltration, ultrafiltration, and hyperfiltration (also called reverse osmosis) are defined. Reverse osmosis separates molecules or ions smaller than 20 Angstroms. The differences in mechanisms for ultrafiltration and reverse osmosis are described, the primary distinction being in the action of the solute on the osmotic pressure of the feed solution. In relation to this action different membrane materials are discussed. Membranes are available in flat, tubular, or hollow-fiber configurations. The manufacture of hollow fibers is described, stressing the importance of the furan resin component which acts as the rejecting barrier of the membrane, and which is chemically very stable. Tests with these membranes show that when used with a solution containing 2,000 ppm of zinc cyanide, the separation rate is 99+% of Z (+2) and 99+% of CN (-1). With a solution of 20,000 ppm of zinc chloride, 99.3% of Zn (+2) is recovered; with potassium chloride at 2,000 ppm the recovery is 99.2%. Reverse osmosis using hollow fiber membranes has several industrial uses. In addition to recovering precious metals from galvanic baths, it can purify dye bath wastes and prepare boiler feed waters. (Blits-FIRL) W78-02026

WASTEWATER TREATMENT EXPERIENCE AT ORGANIC CHEMICAL PLANTS USING A PURE OXYGEN SYSTEM, Union Carbide Corp., South Charleston, WV. D. M. Hardisty, and H. E. Bishop, Jr. AIChE Symposium Series, Vol. 73, No. 167, p 140-144, 1977. 5 fig, 4 tab, 1 ref.

Descriptors: *Activated sludge, *Oil wastes, *Chemical wastes, *Oxygenation, *Biological treatment, Industrial wastes, Biodegradation, Equipment, Treatment facilities, Organic wastes, *Waste water treatment, Oxygen activated sludge, Nutrient addition, Case histories.

Experiences with the use of Union Carbide's UNOX system, an oxygen activated sludge process, in the organic chemicals industry are described. Problems encountered in attempts to use biological treatment processes for the treatment of organic industrial wastes have often been related to variations in the biodegradability of industrial waste water components, unfavorable influent temperature or pH, the lack of nutrients, and the presence of toxic and/or inhibitory compounds in the waste water. Case histories on the use of the UNOX biological treatment system for two applications in the petrochemicals industry and in the coal conversion industry are presented. Treatment at the Union Carbide Corporation facilities in Sisterville, West Virginia, included neutralization, primary clarification, equalization, nutrient addition, UNOX secondary biological treatment, and final clarification for the treatment of wastes resulting from the manufacture of silicones. The second petrochemical complex produced over 250 chemical products and treatment comprised 24 hrs of equalization, primary clarification, nutrient addition, and the use of a two-stage UNOX test reactor. Wastes generated at the coal conversion facility had high concentrations of organics, including phenols, cresol, xylenols, and others. Studies are being conducted to determine the proper combination of stripping, equalization, pH and nutrient adjustment, UNOX, and nitrification for treatment. (Schulz-FIRL) W78-02027

CONTROL OF AEROBIC GROWTH IN ACTIVATED CARBON WASTE WATER TREATMENT, Exxon Research and Engineering Co., Linden, NJ. R. V. Trense, A. Clamen, and J. M. Fernbacher. United States Patent 4,053,396. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol. 963, No. 2, p 621, October, 1977. 1 fig.

Descriptors: *Activated carbon, *Aerobic treatment, *Suspended solids, *Organic wastes, *Hydrogen sulfide, Oxidation, Chemical oxygen demand, Oil wastes, Chemical wastes, *Waste water treatment, *Patents.

Improvements on an activated carbon treatment process designed to remove suspended solids and dissolved organic contaminants from waste waters, such as those resulting from petroleum refining or chemicals manufacturing, having a COD of 100-2000 mg/liter have been patented. The process includes pretreatment to remove suspended solids followed by contact with at least one bed of activated carbon to remove dissolved organic contaminants. The process was improved by the addition of dissolved oxygen to the waste water to suppress the evolution of hydrogen sulfide and to minimize the production of sludge in the bed. The oxygen is added to the waste water before it passes to the activated carbon beds to provide approximately 0.09-0.15 lb oxygen per lb of total COD in the waste water. (Schulz-FIRL) W78-02028

SELECTED USES OF ACTIVATED CARBON FOR INDUSTRIAL WASTEWATER POLLUTION CONTROL, Industrial Environmental Research Lab.-Cincinnati, Edison, NJ. H. S. Skovronek, M. Dick, and P. E. Des Rosiers. Industrial Water Engineering, Vol. 14, No. 3, p 6-13, May/June, 1977. 3 fig, 4 tab, 25 ref.

Descriptors: *Activated carbon, *Adsorption, *Chemical wastes, *Oil wastes, *Industrial wastes, Phenols, Tertiary treatment, Textiles, *Waste water treatment.

The EPA has sponsored several projects under its research and development program for industrial waste water pollution control in order to meet the water quality standards established by Public Law 92-500. Programs conducted by the state of Louisiana in conjunction with the Gulf South Research Institute have investigated water quality in the lower Mississippi River region and have examined advanced waste treatment methods for petrochemical plant wastes. Waste petroleum is being evaluated as a source of activated carbon. Tertiary treatment with oxygen-enriched carbon adsorption is being evaluated by the Union Carbide Corporation for a petrochemical complex in Puerto Rico. Dow Chemical has used a 100-gpm plant to appraise activated carbon adsorption as a means of removing and recovering phenol and acetic acid from an 18% NaCl brine. The Hercules Inc. chemical plant in Hattiesburg, Mississippi, has used a semi-continuous carbon treatment plant for 3.2 mgd of process waste water. Carbon adsorption has been used by the Reichhold Chemicals plant in Tuscaloosa, Alabama, to treat waste water containing phenols, formaldehyde, and urea-formaldehyde resins. An activated carbon treatment facility at a petroleum refinery in Los Angeles has been used to treat periodic storm flow. Other EPA-sponsored projects have evaluated activated carbon use for a Pennsylvania refinery, a textile yarn spinning plant, steel mill polishing effluents, and wastes generated during cleaning and reconditioning of drums and tank trucks. EPA-sponsored studies on the production and evaluation of refuse-derived activated carbon are described. (Schulz-FIRL) W78-02029

THE APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO WASTE WATER ANALYSES USING THE DETERMINATION OF LOW VOLATILITY PETROLEUM-HYDROCARBON COMPOUNDS AS AN EXAMPLE (DIE ANWENDUNG DER DÜNNESCHICHTCHROMATOGRAPHIE IN DER ABWASSERANALYTIK AM REISPEIL DER BESTIMMUNG SCHWERFLÜCHTIGER MINERALÖL-KOHLENWASSERSTOFFE), Stadt Cologne (West Germany). Abwasserlaboratorium.

For primary bibliographic entry see Field 5A. W78-02030

CLARIFIER CATCHES FINE PARTICULATES, Chemical Engineering, Vol. 34, No. 25, p 133-134, November, 1977.

Descriptors: *Clarification, Equipment, *Suspended solids, *Centrifugation, *Industrial wastes, Pulp and paper industry, *Waste water treatment.

The Vortex Clarifier has been manufactured by Bird Machine Company of South Walpole, Massachusetts, for removal of suspended solids and fine particulates from industrial waste waters, for recovery of valuable solids from discharge water, and for polishing of process liquids. The centrifugal unit is designed to work on an operate-flush cycle and requires 1/200 of the space needed for a gravity settling tank. During operation, waste water is pumped into the bottom of the clarifier while the outer shell and inner vaneed hub rotate simultaneously at a speed of 3,600 rpm. The particulates which accumulate on the outer wall are dislodged during the flush phase by two wiper vanes connected to the hub, and the unit is then backwashed. The operate-flush cycle can be set to a cycle time of 30 min to 12 hr. The Vortex Clarifier is reported to be more efficient than disc and bowl centrifuges, since high flowrates in centrifuges create strong eddy currents which remix the fine solids as fast as they are separated. The unit is currently manufactured in a 10 inch-dia size with a capacity of 40-140 gpm; a 24 inch-dia unit with a capacity of 300-1000 gpm should be available in early 1978. The system has been used to

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

reduce solids in a paper mill white-water system by 84% from 1,400 to 224 ppm, and in talc slurry from a roofing mill coating operation by 97% from 450 to 12 ppm. (Schulz-FIRL)
W78-02032

R. O. SYSTEM FOR RINSE WATER.

Water and Waste Treatment, Vol. 20, No. 9, p 54, September, 1977.

Descriptors: *Reverse osmosis, *Membrane processes, *Water reuse, Separation techniques, *Chemical wastes, Costs, Industrial wastes, Filtration, Industrial water, *Waste water treatment, Electropainting wastes.

A reverse osmosis system is being used at the Mooka plant of Kobe Steel Ltd. in Japan to treat rinse water from an electropainting line. The acrylic paint recovery-water reuse system has reduced paint expenditure by 40% and overall costs by 30% for the plant, which uses an electropainting line to apply an acrylic finish to aluminum window frames. The unit is also a closed-loop system which separates the acrylic paint and associated solvents from the water so that both can be reused in the process, eliminating the need for waste water disposal to the municipal waste water treatment system. The reverse osmosis unit was designed by Shinko-Pfaudler Company Ltd. and includes 30 B-9 Du Pont Company 'Permaprep' permeators. Costs to Kobe Steel Ltd. for acrylic paints used in the finishing process were reduced from \$300,000/yr to 180,000/yr with the installation of paint recovery in the reverse osmosis system. Annual operating costs for the system were \$6,700 for electricity and \$23,000 for permeator and cartridge filter replacement, leaving a net savings of approximately \$90,000. The system, which should pay for itself in two years with savings in raw materials, water, and waste disposal costs, produces water which contains less than 0.3% of the acrylic paint ingredients and has a conductivity of less than 80 microohms/cm. (Schulz-FIRL)
W78-02033

ABRASIVE EFFLUENT.

Water and Waste Treatment, Vol. 20, No. 9, p 54, September, 1977.

Descriptors: *Pumping, *Calcium carbonate, *Abrasion, *Filtration, *Dewatering, Equipment, Industrial wastes, Filters, *Waste water treatment, Effluents, Tile polishing wastes, Abrasive effluents.

A waste water treatment and disposal system which was designed by William Boulton Ltd. has been installed at the Saint James Tile Company in Cuffley, England. The highly abrasive effluent, which is actually a slurry of calcium carbonate particles from the tile polishing operations, is collected and flows into a sump. A Mono 'L' Range pump, manufactured by Mono Pumps Ltd., is used to transport the effluent to the top of a thickening tank. The Mono 'L' pump has a helical rotor/stator design to resist wear by abrasion and is equipped with a simplified Flexshaft drive to insure minimum maintenance. A Type 'K' Metripump, manufactured by Metering Pumps Ltd., is used to dose the effluent with polyelectrolyte. Particles which settle to the bottom of the thickening tank are pumped via a second Mono pump to a William Boulton filter press to a pressure of 50 lb/sq in. A ram pump completes the cycle to a maximum pressure of 150 lb/sq in, producing a press cake in the form of a clean, clay-textured filter cake which is discharged into trucks for later disposal. The relatively clean water which overflows a weir at the top of thickening tank is recycled to the tile polishing operations. (Schulz-FIRL)
W78-02034

STREAM ASSIMILATION CAPACITY: A FACTOR IN TRACE ORGANIC WASTEWATER TREATMENT POLICY, Alabama Univ., University.
For primary bibliographic entry see Field 5B.
W78-02035

PHOSPHATE REMOVAL FROM AQUEOUS SOLUTION FROM ACTIVATED RED MUD, Tokyo Univ. (Japan). Dept. of Metallurgy and Materials Science.

S. J. Shiao, and K. Akashi.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 280-285, February, 1977. 9 fig, 7 ref.

Descriptors: *Adsorption, *Nutrient removal, Phosphorus, *Mine wastes, *Mud, Filtration, Heat treatment, Industrial wastes, *Waste water treatment, Bauxite mining wastes, Red muds, *Phosphorus removal.

Solid adsorbents such as fly ash and activated alumina have been used as alternatives to conventional methods of phosphorus removal in waste water treatment. Results of studies on the use of an activated red mud, wasted from the Bayer process for extraction of alumina from bauxite, for phosphate removal are presented. Raw red mud was activated with 20% HCL and used in batch adsorption studies. Studies on the effect of contact time on phosphate removal efficiency indicated that more than 50% of the phosphate was removed during the first 10 min after contact and about 72% was removed within 120 min. The transition point between the initial rapid removal and the later phase of slower removal may represent a transitional point in the adsorption mechanism, after which pore diffusion rather than surface layer adsorption controls phosphate removal. Experiments on the effect of heat treatment and temperature indicated that heat treatment decreased the adsorption capacity of the red mud for phosphate, but the adsorption of phosphate from aqueous solutions by activated red mud was not affected by temperatures up to that of the liquid's boiling point. The phosphate adsorption capacity of activated red mud is reported to be similar to that of F1 alumina. (Schulz-FIRL)
W78-02036

ELECTROLYTIC DETOXIFICATION OF CYANIDES (ELEKTROLYTISK AVGIFTNING AV CYANIDER), J. O. From.

Teknisk Ukeblad, Vol. 124, No. 16, p 39-40, April, 1977. 2 fig, 4 ref.

Descriptors: *Nitrogen compounds, *Electrochemistry, *Chemical wastes, *Electrodes, *Chemical reactions, Chemical precipitation, Oxidation, Industrial wastes, *Waste water treatment, *Cyanide.

A method for the electrolytic decomposition of cyanides in electroplating effluents and spent hardening salts is described. The cyanide electrolyte is oxidized to cyanate and further to carbon dioxide and nitrogen in an electrolyzer with graphite anodes and steel cathodes at a potential of 2.5-3 V and a current density of less than 4 A/d-sq m. This method is also suitable for the decomposition of nickel cyanide and iron cyanide complexes. The electrolyte is circulated during electrolysis. The metals precipitated on the cathode can be easily recovered. When adding sodium chloride to the electrolyte, sodium hypochlorite is generated continuously; this substance will react with cyanide, yielding sodium chloride, which is oxidized again to sodium hypochlorite. This reaction requires a pH value of 10-11 and a temperature of 40-50°C. The energy consumption amounts to 6-12 kWh/kg of CN. (Takacs-FIRL)
W78-02038

SOME ION EXCHANGE APPLICATIONS TO RECOVER AND REUSE VALUABLE MATERIALS FROM POLLUTANTS, G. S. Ranganathan.
Indian Chemical Journal, Annual Number, p 122-125, 1977. 1 fig.

Descriptors: *Recycling, *Separation techniques, *Ion exchange, *Cation exchange, *Anion exchange, Industrial wastes, Fertilizers, Ammonia, Mercury, Chromium, Acids, *Waste water treatment.

Applications of ion exchange in the recovery and recycling of industrial waste constituents are described. Zinc recovery and reuse is described for the process and regeneration/elution cycles of viscose rayon and tire cord manufacture. The recovery of ammonia from fertilizer manufacturing wastes can be accomplished by adsorption onto a strongly acidic cation exchanger. Mercury can be removed from chlor-alkali manufacturing wastes by adsorption onto a basic anion exchanger, which can be regenerated with acidified hydrogen sulfide. Ion exchange resins can also be applied to the removal of cyanide and chromium from plating shop effluents. In treatment of plating wastes, effluent first passes through an activated carbon filter for removal of organic matter and suspended solids. Cyanides can be destroyed with an oxidizing agent such as sodium hypochlorite, and chromates with a reducing agent such as sodium metabisulfite or sulfur dioxide. The use of a hydrogen-ion exchange treatment unit for the recovery and reconstitution of chromic acid in an anodizing bath is described. (Schulz-FIRL)
W78-02039

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS IN FERTILIZER INDUSTRY, Fertilizer Corp. of India, Trombay.

Y. R. Pakkala.
Indian Chemical Journal, Annual Number, p 107-108, 1977.

Descriptors: *Fertilizers, *Acids, *Carbon, *Gypsum, *Recycling, *Chemical wastes, Filtration, Activated carbon, Phosphorus compounds, Air pollution, Waste treatment, *Waste water treatment.

Increasing demands on cropland in India have led to an increase in the number of fertilizer manufacturing operations. Since discharge of gaseous and liquid wastes from these fertilizer plants poses a hazard to the environment, efforts have been made by the Fertilizer Corporation of India Ltd. in Trombay to utilize some of the by-products or recover the waste products in order to minimize the pollution problem. Recovery of fine carbon particles in an ammonia plant where the Shell partial oxidation process is used is accomplished with a continuous disc filter. A filter cake which contains 15-20% carbon is produced while the filtrate is recycled through the plant. The carbon can then be reused in rubber, paint, printing ink, and activated carbon industries. Dimethyl ether produced during the synthesis of methanol is recovered by scrubbers at a rate of 300 tons/yr for use in solvent extraction and as a propellant for aerosols. Gypsum recovery at a phosphoric acid plant amounts to about 450 tons/yr. Hydrofluorosilicic acid is recovered in rubber-lined, carbon steel scrubbers for the production of aluminum fluoride and cryolite. Dilute nitric acid is concentrated for use in the manufacture of drugs, explosives, and dyes and is used along with dilute sulfuric acid for the acidulation of phosphate rock in the manufacture of phosphoric acid. A double absorption system for the removal of sulfur dioxide and acids from emissions is being installed. (Schulz-FIRL)
W78-02040

RE-USE OF WASTE WATERS,
M.L. Shah.

Indian Chemical Journal, Annual Number, p 137-139, 1977. 2 ref.

Descriptors: *Water reuse, *Effluents, *Tertiary treatment, *Industrial water, *Industrial wastes, Sewage treatment, Sewage disposal, Foreign countries, Pulp and paper industry, Textiles, Oil wastes, Fertilizers, *Waste water treatment, Waste water disposal, India.

Rapid industrialization and increased demands on water supplies for municipal and irrigation purposes have led to the consideration of reuse of domestic and industrial waste waters in India. Union Carbide India Ltd. in Chembur, India, has begun using a 4,540-mld tertiary treatment plant to treat domestic waste water for reuse in cooling, processing, air-conditioning, and other operations. Costs for the treated domestic waste water were 65 paise/1000 liters as compared with 100 rupees/1000 liters for water obtained from Bombay's municipal water supplies. Additional applications in which tertiary treatment was used to treat sewage water for use as make-up water for air-conditioning systems in high-rise buildings are described. General characteristics of industrial effluents which may influence their capacity for reuse are evaluated. Industries in India which currently reuse some portion of process waters include textile mills, pulp and paper industries, oil refineries, thermal power stations, and iron and steel plants. Additional treatment of blast furnace flue dust wash water and rolling mills effluent is normally required in the steel industry before these effluents can be recirculated. Recirculating of process waters is discussed for the fertilizer industry which manufactures urea, ammonia, acid, and granular fertilizer. (Schulz-FIRL) W78-02041

TRC DEDICATES TREATMENT PLANT.

American Dyestuff Reporter, Vol. 66, No. 11, p 17, 58, November, 1977.

Descriptors: Chemical wastes, *Neutralization, *Activated sludge, *Oxidation lagoons, *Industrial wastes, Clarification, Sludge digestion, *Treatment facilities, *Waste water treatment, Toms River(NJ).

A new \$15.5-million waste water treatment plant with an expected annual operating cost of \$4.5 million has been dedicated at Toms River Chemical Corporation in Toms River, New Jersey. The 45-acre facility includes equalization basins, lime treatment facilities for neutralization, mechanical clarifiers for removal of suspended solids, and aerated lagoons for removal of soluble organics by biological oxidation. Construction of the new waste treatment facilities involved renovation and expansion of existing neutralization and equalization facilities, the installation of an additional clarifier, and the construction of an activated sludge system equipped for digestion and dewatering of sludge. A building which houses air compressors and pumps and another which houses sludge filters, control rooms, laboratories, offices, and personnel facilities were also erected. Toms River Chemical, jointly owned by Ciba-Geigy Corporation and an affiliate of Sandoz Ltd. of Basle, Switzerland, has modified production processes, eliminated some products, and conducted extensive research and development to assure compliance with regulations imposed by the EPA. (Schulz-FIRL) W78-02042

DISPOSAL OF SWEET CHERRY PROCESSING BRINES.

Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center. G. M. Sapers, O. Panasiuk, and L. R. Ross. Journal of Food Science, Vol. 42, No. 6, p 1454-1456, 1977. 8 tab, 10 ref.

Descriptors: *Neutralization, *Brines, *Brine disposal, *Chemical precipitation, Sulfur compounds, Sulfite liquors, Sulfates, Oxidation, Canneries, Calcium, Industrial wastes, Food processing industry, Waste water treatment, Waste water disposal. Identifiers: Cherry processing brines.

Various strategies for the disposal and treatment of cherry processing brines were investigated, including brine neutralization and calcium sulfite precipitation, the anaerobic degradation of neutralized brine, the oxidation of residual sulfur dioxide with hydrogen peroxide, deep well disposal, and brine reformulation with calcium dihydrogen phosphate. Studies with waste brines simulated from dry mix formulations used to process Windsor cherries indicated that in neutralization with calcium hydroxide, even when approximately 140% of the amount theoretically required for the neutralization of bisulfite was added, some SO₂ remained in the brine. This was attributed to the presence of organic acids and bisulfite which interfered with calcium sulfite precipitation. Studies on the effect of organic acids on precipitation of calcium sulfite indicated that the presence of citric and malic acids resulted in higher residual SO₂ concentrations than did fumaric acid. The studies also indicated that sulfite reductions could be enhanced by oxidation with hydrogen peroxide. The proposed treatment process involves separation of the precipitated calcium sulfite and sulfate from the neutralized brine by filtration, centrifugation, or sedimentation. Washing of the sludge to remove fermentable solids is recommended to alleviate possible objectionable odors arising during storage under anaerobic conditions. (Schulz-FIRL) W78-02044

TREATING THE WATER FOR WATNEY'S.

For primary bibliographic entry see Field 5A. W78-02046

CALIFORNIA'S FOOD INDUSTRY WASTE-WATER MANAGEMENT CHALLENGE.

Montgomery (James M.), Walnut Creek, CA. R. A. Tsugita, R. H. Ellis, and C. A. Kahr. Civil Engineering-ASCE, Vol. 47, No. 7, p 62-68, September, 1977. 2 fig, 3 tab.

Descriptors: *Food processing industry, *Activated sludge, *Aeration, *Industrial wastes, *Canneries, Water quality standards, Water pollution control, Oxidation lagoons, Trickling filters, Return flow, *Waste water treatment.

Various aspects of food processing waste treatment practices in California are discussed. Since most food processing waste waters are free of toxic chemicals, biodegradable, and generally contain high concentrations of organic materials and suspended particles, biological treatment processes have been widely used. General characteristics of food processing wastes and regulations imposed upon food processing effluents by the 1972 Federal Water Pollution Control Amendments are discussed. Approximately 75% of California's fruit and vegetable canneries and meat and poultry packing plants discharge their waste directly to municipal treatment systems, as compared to a national average of 60%. The activated sludge process has been used by many municipal treatment plants to meet PL92-500 standards of 30 mg/liter for BOD and suspended solids. Particularly effective are the high-purity oxygen activated sludge process and the roughing filter/activated sludge system. Waste water treatment systems used by California food processing industries which do not discharge their wastes to a municipal system include ponding systems such as aerated lagoons, stabilization/evaporation ponds, facultative ponds, and percolation systems. Trickling filters, activated sludge units, and land disposal systems employing spray irrigation, surface irrigation, and overland flow have also been

used. The use of in-plant controls to reduce waste usage and/or waste generation at the source through improved operational procedures or the use of process modifications is discussed. Waste water management systems and combinations of systems available to the food processing industry are described. (Schulz-FIRL) W78-02047

ARTICHOKE INDUSTRIES—CUTTING BOD BY 95%.

Civil Engineering-ASCE, Vol. 47, No. 7, p 63, September, 1977.

Descriptors: *Food processing industry, *Flotation, *Biochemical oxygen demand, *Water consumption, *Treatment facilities, Activated sludge, Canneries, Pilot plants, Industrial wastes, *Waste water treatment, Castroville(CA).

Artichoke Industries in Castroville, California, the sole processing plant for artichokes in the United States, processes over 14,000 tons of artichokes annually. Increasing production during the 1950's led to overloading of the local municipal treatment plant, and an industrial waste water ordinance limited Artichoke Industries' discharge in 1963 to 60,000 gpd and 240 lb BOD/day. Although in-plant modifications had already reduced water consumption, further process changes were necessary to reduce the BOD of 3,750 lbs/day to the required level. A physical-chemical treatment system which was instituted in 1967 to utilize ferric chloride and lime addition only reduced the BOD in discharge waste water to 700 lbs/day. Laboratory and pilot-scale tests led to the conversion of the chemical precipitation unit to an air flotation tank with skimming for solids removal. Additional studies indicated that segregation of the waste into three streams would be beneficial. Pilot studies with an air-activated sludge system which removed 97% of the BOD led to the conversion of an existing holding tank to a full-scale activated sludge system with nutrient addition in pretreatment. Current operations at the facility produce 20,000-40,000 gpd of waste water flow with an average BOD of 150 mg/liter. (Schulz-FIRL) W78-02048

AT SUNKIST, LEMONS AND ORANGES DON'T MIX.

Civil Engineering-ASCE, Vol. 47, No. 7, p 64, September, 1977.

Descriptors: *Citrus fruits, *Canneries, Food processing industry, *Return flow, *Activated sludge, Biochemical oxygen demand, Treatment facilities, Lemons, Oranges, Effluents, Industrial wastes, *Waste water treatment.

Two citrus processing waste treatment facilities operated by Sunkist Growers in southern California for the treatment and disposal of high-strength wastes are described. The Orange Products Division in Ontario processes over 500 citrus by-products from oranges, grapefruit, and tangerines, generating approximately 1.7 mgd of high-strength waste water. Waste water is conveyed by gravity pipelines to a 230-acre farm for land application. A portion of the process waste with a high salt content is discharged to the Los Angeles County Sanitation District's system. The Lemon Products Division in Corona produces over 300 different lemon products, including juice concentrates, pectin, lemon oil, dried peel products, and beverage bases. Since discharge requirements established by the California Regional Water Quality Control Board did not allow the use of a land disposal system, a \$6.5-million high-purity oxygen activated sludge system was selected for pretreatment of the 1.5 mgd of high-strength waste prior to disposal to the municipal sewer. (Schulz-FIRL) W78-02049

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

TREATMENT PROCESS FOR COPPER PYROPHOSPHATE ELECTROPLATING RINSE WATERS

Agricultural Research Service, Peoria, IL. Northern Regional Research Lab. R. E. Wing, W. E. Rayford, and W. M. Doane. Metal Finishing, Vol 75, No 5, p 101-104, May, 1977. 7 tab, 28 ref.

Descriptors: Chemical reactions, *Chemical precipitation, *Copper, *Phosphorus compounds, *Separation techniques, Hydrolysis, Metals, Lime, Calcium chloride, Calcium hydroxide, Hydrogen ion concentration, Phosphates, Industrial wastes, *Waste water treatment, Plating wastes, Pyrophosphates.

The treatment of copper pyrophosphate baths and rinses used in the plating of printed circuits is governed by EPA regulations on plating effluents. A treatment process designed to lower the copper and phosphorus concentrations was tested with synthetic and actual rinse waters. The treatment process involves the addition of calcium hydroxide or lime at pH values above 9 to remove copper and phosphorus from fresh baths which contain relatively little orthophosphate, and the substitution of calcium chloride for lime as the orthophosphate concentration builds up to more than 12 oz/gal. The optimum amounts of calcium as calcium hydroxide, lime, or calcium chloride required to reduce the concentration of copper to less than 0.02 mg/liter and total phosphorus concentration to less than 1 mg/liter were determined with synthetic solutions. The studies indicated that 2.7 moles Ca(++) removed 0.9 moles P2O7(4-) and 2.0 moles Ca(++) removed 1.0 moles HPO4(2-). Results of the use of the treatment process for actual copper pyrophosphate baths and for diluted dragout rinses from these baths are presented. The use of carbonation with CO2 to remove the residual Ca(++) is recommended. An anionic polyelectrolyte can be added at a concentration of 3.5 mg/liter to facilitate settling of the phosphate sludge. Chemical costs for the treatment process with lime and a polymer were estimated at \$0.16/1000 gal. (Schulz-FIRL)

W78-02050

PURIFICATION OF NICKEL AND COBALT ELECTROPLATING SOLUTIONS

Metalux Corp., Paterson, NJ. (Assignee). R. Merker, and S. Luca. United States Patent 4,053,400. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol 963, No 2, p 622, October, 1977.

Descriptors: *Electrochemistry, *Heavy metals, *Separation techniques, Chemical reactions, *Filtration, Industrial wastes, Acidic water, Zinc, Copper, Iron, Metals, Nickel, Cobalt, Chemical precipitation, *Waste water treatment, *Patents, Electroplating wastes.

A process has been patented which utilizes electrodeposition of nickel and cobalt from aqueous acidic solutions, such as electroplating solutions, which contain the metals in an ionic form. The solution, in which metals such as zinc, copper, and iron build up during use, is periodically filtered to remove the metallic impurities. The process has been improved by the addition of an organic compound having the general formula a-S-X to the solution during filtration to precipitate the metallic impurities. The compound has a radical group represented by 'a' which includes N, C, S, and either methyl, ethyl, or butyl. 'X' in the formula consists of H, Na, K, Li, or Co. (Schulz-FIRL)

W78-02051

SLUDGE TREATING PROCESS,
Nichireki Chemical Industry Co. Ltd., Tokyo (Japan). Assignee.
F. Fukushima, T. Sugita, K. Kobayashi, H. Asada, and A. Onishi.

United States Patent 4,053,401. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol 963, No 2, p 622, October, 1977.

Descriptors: *Sludge treatment, *Separation techniques, *Mercury, *Cadmium, *Coagulation, Arsenic, Sulfur compounds, Chemical precipitation, Industrial wastes, *Patents, *Waste water treatment, Dodecyl mercaptan.

A process has been patented for the treatment of sludges which contain toxic pollutants such as mercury, cadmium, lead, or arsenic. A bituminous emulsion and dodecyl mercaptan are added to coagulate and solidify the sludge. For the treatment of sludges which contain mercury, the sludge is coagulated and solidified by the addition of a bituminous emulsion and colloidal sulfur. (Schulz-FIRL)

W78-02052

SOX'S KEY ROLE: TREATING METAL WASTES

Canadian Chemical Processing, Vol 61, No 10, p 27-28, October, 1977. 1 fig.

Descriptors: *Solvent extractions, *Separation techniques, *Organic compounds, *Metals, *Recycling, Industrial wastes, Uranium, Zirconium, Copper, Cobalt, *Waste water treatment.

Increases in chemical costs and stricter waste water disposal regulations have created incentives to use solvent extraction for recovery of valuable substances from industrial wastes. At the present time more than 40 agents are available for solvent extraction in metals recovery. Copper is currently being recovered from leach solutions at a rate of 200 Gg/yr by solvent extraction followed by electrowinning. Chromium and vanadium have been recovered from low-grade iron ores in Canadian mining operations by extraction with a strongly alkaline leach solution. Studies in Sweden have investigated the recovery of zinc from mill flue dust, neutralization sludge, and nickel-cadmium battery scrap. The International Nickel Corporation in Sudbury, Ontario, is currently investigating cobalt recovery. Eldorado Nuclear, a uranium refining operation, has used solvent extraction in pilot studies to purify zirconium and to recover uranium as uranium oxide and uranyl nitrate. The feasibility of solvent extraction in a particular industry is suggested to be a function of metal values, organic solvent costs, and the effects of organic solvents on aquatic life in receiving waters. (Schulz-FIRL)

W78-02053

MONITORING PLANT EFFLUENT WITH OPEN-CHANNEL FLOW METER

Vulcan Mold and Iron Co., Trenton, MI.
For primary bibliographic entry see Field 5A.
W78-02054

TREATMENT OF ELECTROPLATING EFFLUENTS IN METAL-WORKING INDUSTRY (GALVAN SZENNYVIZEK TISZTITASA A FEMSZERELVENEKGYARTAS FOLYAMAN)

F. Mosoni.
Gegpyartastechnologia, Vol. 17, No. 4, p 156-158, April, 1977.

Descriptors: *Chromium, *Metals, *Chemical precipitation, *Neutralization, Industrial wastes, Chemical reactions, Effluents, *Waste water treatment.

The treatment of electroplating effluents at a metal fixtures factory in Hungary is described. The cyanide-free effluents contain acids, bases, and hexavalent chromium. The acid and basic effluents are neutralized in a common reactor, while the hexavalent chromium is reduced to trivalent chromium by monobasic sodium sulfite at pH 2.5. The metals are precipitated with sodium hydroxide at pH 8.5-9.5, and then settled in a settling basin

for 2 hr. The sludge is dewatered by means of a scroll centrifuge to a dry matter content of 25-30%. (Takacs-FIRL)

W78-02055

FILTERS AND CLARIFIERS

Water and Waste Treatment, Vol. 20, No. 9, p 78, September, 1977.

Descriptors: Equipment, *Clarification, *Separation techniques, *Filters, Industrial wastes, Centrifugation, Filtration, *Waste water treatment.

Sala Ltd. of England produces a wide variety of filters, clarifiers, and thickeners for use in mineral processing. A Sala belt drum filter is being used in Nottingham to filter a fine froth-floated coal and has been used extensively in the sewage and pulp and paper industries. The unit is equipped with a belt tracking device and can be used with either roller discharge or an air knife discharge. The disc or drum filters can be arranged for 'snap blow' or belt discharge with normal or top feed. The Sala Lamella thickener/clarifier is available in sizes of 16-500 sq m. Since the gravity sedimentation units do not require as much ground area as conventional thickeners, they are suggested for use in pollution control where space is limited. Centrifugal pumps are available with rubber-covered or Ni-hard parts. Sala also produces a series of Krebs hydrocyclones for particles separation in a size range of 2-100 microns. (Schulz-FIRL)

W78-02057

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED

S. J. Khambatta, and C. M. Ketkar.
Indian Chemical Journal, Annual Number, p 109-113, 1977. 4 tab, 3 ref.

Descriptors: *Pulp and paper industry, *Activated sludge, *Return flow, *Fertilizers, *Nutrient removal, Effluents, Industrial wastes, Aeration, Sludge treatment, Treatment facilities, *Waste water treatment, Waste water disposal.

The Pudumjee Pulp and Paper Mills Ltd. in India have begun using an advanced waste water treatment plant to treat activated sludge treatment plant effluents for use in irrigation. During treatment at the 1.6-mgd plant, effluents are pumped to a bar screen, a venturi flume for flow metering, a flash mixer for pH adjustment, and a primary clarifier which removes floating matter and suspended solids and reduces BOD by 20-25%. The effluent is then mixed with recycled activated sludge, and nutrients in the form of urea and phosphoric acid are added at a rate of 100 kg BOD:5 kg N:1 kg P. The mixture is aerated with fine bubble diffusers to produce a dissolved oxygen concentration of 2.0-3.5 mg/liter. A secondary clarifier is used to separate the treated effluent from the activated sludge. The treated effluent which satisfies standards set by the Indian government is distributed through a network of pipelines and canals to irrigate 300-500 acres of neighboring agricultural land. Sludge from the primary clarifiers is used as fuel and fertilizer by the local population. (Schulz-FIRL)

W78-02058

PREVENTION OF ENVIRONMENTAL POLLUTION IN THE MAN-MADE FIBER INDUSTRY DURING THE 10TH 5-YEAR-PLAN (OBEZVREZHIVANIE OKRUZHAYUSHCHEI SREDEY ZHIVNATII ISKUSSTVENNYKH VOLOKNA V DESYATOI PYATIPETKE)

V. P. Kim, I. I. Chicherin, and A. N. Selin.
Khimicheskie Volokna, No 2, p 29-31, 1977. 2 fig.

Descriptors: *Water pollution control, *Pulp and paper industry, *Textiles, *Water quality management (Applied), Water reuse, Water consumption,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

*Waste water treatment, Foreign countries, USSR.

Measures to be implemented in the areas of clean air maintenance and water pollution prevention in the man-made fiber industry of the USSR during the tenth 5-yr-plan are discussed. The fiber production will have to be increased by 52-62% without increasing the water consumption. The specific water consumption and the effluent discharge will have to be reduced by the adoption of new technologies entailing lower water consumption, closed water cycle, and partial recirculation of slightly polluted water. The use of certain harmful chemicals such as carbon disulfide should be eliminated by the introduction of new technologies. Three-stage waste water treatment on plant premises is envisaged. (Takacs-FIRL) W78-02059

TREATING WOOL SCOUR WASTE.

Australian Patent 478,434. Issued December 2, 1976. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 45, p 4406, December, 1976.

Descriptors: *Flocculation, *Surfactants, *Detergents, *Textiles, *Patents, Separation techniques, Industrial wastes, *Waste water treatment, Wool processing wastes, Polyacrylamide.

A process for treating spent or partially spent liquors used in the scouring of raw or ripe wool has been patented. After the aqueous soap or synthetic detergent solution is removed from the scour bowl, an effective non-ionic or cationic polyacrylamide is added in the form of an aqueous solution to give a flocculant concentration of 1-20 ppm by weight in the spent liquor. The liquid is held to allow sufficient separation of the solids and liquor. After the solids are removed, the clarified liquor can be discharged or recycled. (Schulz-FIRL) W78-02060

DISPERSE DYE-CARRIER INTERACTIONS ON ACTIVATED CARBON.

Massachusetts Univ., Amherst. Dept. of Civil Engineering. F. A. DiGiano, and A. S. Natter. Journal Water Pollution Control Federation, Vol. 49, No. 2, p 235-244, February, 1977. 15 fig, 3 tab, 9 ref.

Descriptors: *Dyes, *Dye dispersion, *Activated carbon, *Adsorption, *Surfactants, Textiles, Color, Industrial wastes, Separation techniques, *Waste water treatment, Dyehouse waste, Disperse wastes, Dye carriers, Cationic surfactants, Dye removal.

Interactions between disperse dyes and other waste constituents, the removal of several different dye bath waste constituents in a carbon bed, and the effects of carrier and cationic surfactant concentrations on removal of disperse dyes were investigated with dye bath constituents obtained from Ware Knitters, Inc., in Ware, Massachusetts. The disperse dyes used in the study were Foron Yellow E-3GFL, Foron Rubine SE-GFL, and Foron Blue E-GFLN. Tanavol APP and Hostetex L-PEC were used as dye carriers and Katapol VP-532 as the cationic surfactant. Studies with two carbon columns indicated that although carrier concentrations as high as 4000 mg/liter were added to the dye bath waste, color removal was still inadequate and high carrier concentrations shortened the life of the carbon column. Lower dye removals with 50 mg/liter of Katapol VP-532 were attributed to adsorption by the cationic surfactant, which decreased the number of adsorption sites available to the dyes. Addition at 150 mg/liter resulted in decreased dye concentrations in the feed and enabled complete removal in the column. The use of a surfactant as a coagulant prior to contact with activated carbon is suggested to provide

adequate means of treatment for textile dyes while extending the life of the carbon bed. (Schulz-FIRL) W78-02061

MUNICIPAL SEWERS HELP SOLVE WASTE DISPOSAL PROBLEMS.

Armco Steel Corp., Kansas City, MO.

J. K. Fuller.

Industrial Wastes, Vol. 23, No. 5, p 34-37, September/October, 1977. 1 fig, 1 tab.

Descriptors: *Neutralization, *Oxidation, *Aeration, *Treatment facilities, *Acidic water, Equalizing reservoirs, Sodium compounds, Steel, *Waste water treatment, Waste water disposal, *Sewers, Kansas City(MO).

The Armco Steel Corporation plant on the Big Blue River in Kansas City, Missouri, produces a variety of high carbon rod products in its rod cleaning and wire coating operations. The rod cleaning facilities include two 8,000-gal sulfuric acid pickling tubs. The wire coating facility uses hydrochloric acid in two copper coating lines and an aluminumizing line, and acidized flux (zinc ammonium chloride) in the galvanizing lines. Since water quality standards imposed by the Missouri Clean Water Commission prohibit direct discharge of treated or untreated process water, the treatment and disposal plant for the acidic rinses was designed to allow discharge to the Kansas City sewer system. The rod cleaning and wire coating wastes are first pumped through a bar screen chamber to a 1200-ft circular concrete reinforced basin which is lined with acid brick. After retention for 30 min, three end-suction centrifugal pumps transport the water through a high density polyethylene underground pipeline to the treatment plant. The treatment facility includes chemical storage facilities, Leeds and Northrup pH control and flow measuring equipment, and the chemical metering pumps. The rinse water, which has a pH of 2.0, is neutralized with a 50% NaOH solution in a 10,000-gal partially buried mixing tank. The tank is equipped with a submerged turbine aerator for oxidation of the ferrous iron in the waste water. The pH control system is used to adjust and maintain the pH of the treated waste water at 8.5. (Schulz-FIRL) W78-02062

SPENT SULPHURIC ACID WASTES CONVERTED TO USEFUL GYPSUM.

Chemical Processing, Vol. 40, No. 8, p 105, July, 1977.

Descriptors: *Gypsum, Calcium compounds, *Calcium sulfate, *Acidic water, *Neutralization, Metals, Titanium, Industrial wastes, *Waste water treatment, Sulfuric acid, Titanium dioxide.

American Cyanamid Corporation of Bound Brook, New Jersey, has begun using a process for the production of gypsum from spent sulfuric acid produced during the sulfate process of titanium dioxide manufacturing. The neutralization facilities at Cyanamid's titanium dioxide plant in Savannah, Georgia, treat 4 mgd of strong and weak acid which is combined with 20 mgd of non-process waste water prior to discharge. The gypsum conversion process to prevent water pollution by spent sulfuric acid wastes is recommended for titanium dioxide plants and for other industrial manufacturing operations where sulfuric acid streams of low and medium strength are generated. (Schulz-FIRL) W78-02064

TURNING WASTE WATER AROUND.

Rohm and Haas Reporter, Vol. 35, No. 3, p 17-19, Fall, 1977.

Descriptors: *Acidic water, *Anion exchange, *Water reuse, *Filtration, *Ion exchange, Indus-

trial water, Industrial wastes, Suspended solids, Neutralization, Chemical wastes, Waste water treatment.

The Western Electric plant at Lee's Summit, Missouri, produces a waste discharge of more than 1 mgd in the form of a dilute acid waste stream with a pH of 2-3. Approximately 400,000 gpd consist of high-quality water which has been treated by the plant's large deionization facility. Lime treatment of the dilute acid waste which had been used for neutralization resulted in increased total dissolved solids. Studies were conducted in 1973 to develop a method of treatment which would render the water pure enough for reuse but not result in increased dissolved solids. An evaluation of the use of Amberlite, a weak base anion exchange resin manufactures by Rohm and Haas, indicated that a pilot plant employing 6 cu ft of resin was capable of treating 2,000 gpd. A larger unit was constructed to handle 200,000 gpd with provisions for scaling up to 600,000 gpd of low-conductivity, low-acidity water for reuse. A stainless steel disc filter is used to remove solids over 200 microns and an anthracite filter removes additional solids and oil. An 85-cu-ft column of Amberlite IRA-94 ion exchange resin neutralizes wastes and removes organics from the water, producing an effluent with a total dissolved solids concentration of approximately 100 ppm and a pH of 7-10. (Schulz-FIRL) W78-02065

INDUSTRIAL PRESSURE LEAF FILTERS.

Water and Waste Treatment, Vol. 20, No. 9, p 36, September, 1977.

Descriptors: *Filters, *Filtration, Equipment, *Separation techniques, *Industrial wastes, Chemical wastes, Food processing industry, *Waste water treatment, Filtration, Industrial pressure leaf filters.

Amafilter Ltd., a British subsidiary of the Dutch company Amafil B. V. of Alkmaar, Holland, has begun producing the Ama-Niagara range of vertical leaf pressure filters. The units are available with vertical or horizontal tanks for filter areas of 2.2-300 sq m and can be equipped with a wide range of accessories, including heating or cooling jackets, a cake thickness detector, and pneumatically operated clean-out doors. An oscillating sluice pipe allows operation with automatic dry or slurry cake discharge. The filters are designed for solids separation in the chemical, petrochemical, pharmaceutical, food processing, and brewing industries. The units, which can be constructed of mild steel, stainless steel, monel, and titanium, can also be equipped with hydraulically-operated bayonet ring closures and a retractable filter leaf cartridge. (Schulz-FIRL) W78-02066

PHOTODECOMPOSITION OF ODOROUS CHLOROPHENOLS IN WATER.

National Inst. for Environmental Studies, Tsukuba (Japan). Dept. of Chemistry and Physics. A. Yasuhara, A. Otsuki, and K. Fuwa. Chemosphere, Vol. 6, No. 10, p 659-664, 1977. 3 fig, 18 ref.

Descriptors: *Phenols, *Odor, *Chemical analysis, Analytical techniques, *Ultraviolet radiation, Chemical wastes, Industrial wastes, *Chemical reactions, Chlorination, *Waste water treatment, *Chlorophenols, *Photodecomposition(Phenols).

Odorous chlorophenols can be produced by the reaction of organic compounds in waste water with chlorine during disinfection by chlorination. Deodorization of chlorophenols by photolysis was investigated with 10-ppm solutions of 2-, 3-, and 4-chlorophenols irradiated with a 400W high-pressure mercury lamp. Experiments indicated that 4-chlorophenol was decomposed very easily by photolysis, forming phenol which was identified by gas chromatography-mass spectrometry. The 2-

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chlorophenol decomposed to some degree while 3-chlorophenol was hardly affected by photolysis. A straight line plot of residual chlorophenols against irradiation time indicated that the reactions were first-order with rate constants of 0.0002/sec for 2-chlorophenol, 0.000036 for 3-chlorophenol, and 0.0014 for 4-chlorophenol. Photolysis at an irradiation time of less than 1 hr was not considered effective in deodorization since 2-chlorophenol is the major odorous component in monochlorophenols. Studies were conducted on the decomposition of 2- and 4-chlorophenols by ultraviolet irradiation for 1 hr in the presence of hydrogen peroxide at 15°C and 1 atm nitrogen. The phenol formed from the decomposition of 4-chlorophenol was photooxidized in the presence of hydrogen peroxide. At hydrogen peroxide concentrations over 1000 ppm the odorous 2-chlorophenol was also decomposed, suggesting feasibility of the treatment process for industrial waste waters. (Schulz-FIRL) W78-02068

HEMICELLULOSE-B FROM COMMERCIAL PINEAPPLE JUICE UNDERFLOW,
Hawaii Univ., Honolulu. Dept. of Food Science and Technology.
J. K. C. Chan, and J. H. Moy.
Journal of Food Science, Vol. 42, No. 6, p 1451-1453, 1977. 4 fig, 1 tab, 8 ref.

Descriptors: *Canneries, *Solvent extractions, *Tropical fruits, *Cellulose, *Pulp wastes, Food processing, Recycling, Industrial wastes, Separation techniques, Hydrolysis, Waste disposal, *Waste water treatment, Pineapple processing wastes, Hemicellulose-B, Acid hydrolysis, Enzyme hydrolysis.

At least 7,200 gal/day of centrifuged pineapple juice underflow, the wet suspended solid removed from the centrifuge in the process of juice manufacturing, can be produced as waste at a large pineapple cannery. Previous studies have investigated the recovery of several by-products from commercial pineapple juice underflow, including pineapple oleoresin, pineapple syrup, hemicellulose-B, and alpha-cellulose. Results of studies on the characterization and hydrolysis of hemicellulose-B after its isolation from the centrifuged pineapple juice underflow are presented. The scheme for extraction and isolation of various fractions in centrifuged underflow obtained from Dole Pineapple Company in Honolulu, Hawaii, is described. Details of the acid hydrolysis, enzymatic hydrolysis, and hydrolysis deionization techniques used in the preparation of hemicellulose-B hydrolysis are presented. The hemicellulose-B was recovered at 9.8% dry weight by freeze drying from a juice underflow which had 80.6% moisture. Comparisons of chromatographs produced from acid and enzymatic hydrolysis indicated that the chemical compositions in terms of sugars were identical. Industrial application of the hemicellulose-B recovery method is recommended with recovery of the alcohol, acetone, and sodium acetate used in the process to eliminate the creation of new pollution sources. Treatment with 17.5% sodium hydroxide extraction and 85% phosphoric acid treatment to remove insect fragments would make possible the use of hemicellulose-B as a thickener in syrups, beverages, and other food products. (Schulz-FIRL) W78-02069

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 698. Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-304, December 1976. 503 p, 131 fig, 156 tab, 175 ref.

Descriptors: *Food processing industry, *Canneries, *Poultry, *Fruit crops, *Vegetable crops, Effluents, *Waste water treatment, Waste treatment, Recycling, Shellfish, Proteins, Design data, Operation and maintenance, Industrial wastes, Waste disposal.

Texts are supplied for 26 of the 27 papers presented at the Seventh National Symposium on Food Processing Wastes. The symposium was held in Atlanta, Georgia, on April 7-9, 1976, and was co-sponsored by the National Canners Association, American Meat Institute, Southeastern Poultry and Egg Association, and the Pacific Egg and Poultry Association. The papers cover a wide range of treatment, disposal, and recycling techniques for industries such as fish, shellfish, meat, and poultry processing; fruit and vegetable canneries; and wineries. Studies on the toxicity of food processing effluents to fish and on techniques for reducing waste water production through process changes are presented. (See W78-02071 thru W78-02090) (Schulz-FIRL) W78-02070

A WASTEWATER TREATMENT STUDY FOR SKOKOMISH SALMON PROCESSING PLANT,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
S. S. Lin, P. B. Liao, and M. W. Cochran.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. P 21-42, 4 fig, 13 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Canneries, *Fish handling facilities, *Salmon, *Aeration, *Activated sludge, Water pollution control, Biological treatment, Pilot plants, Food processing industry, Industrial wastes, Waste water treatment, Skokomish River(WA), Salmon processing wastes.

Regulations imposed in 1973 by the EPA and the State of Washington required the Skokomish Salmon Processing Plant in Shelton, Washington, to treat its waste water before discharge into the Skokomish River. The facility designed by Kramer, Chin, and Mayo, Inc., of Seattle included an extended aeration system and two identical aerobic polishing ponds. Treated effluent passes to a soil disposal field for distribution through a 6 inch perforated plastic pipe. In an effort to monitor operations at the treatment facility and to provide data on fish processing wastes, grab and composite samples were collected from eight stations at the plant. Samples were analyzed for pH, DO, temperature, BOD, COD, SS, VSS, TS, grease and oil, TKN, alkalinity, turbidity, ortho-P, total-P, MLSS, and MLVSS. Waste water characteristics were observed to fluctuate with processing period, including large salmon processing, small salmon processing, fish food addition, and no activity except repacking. Treatment efficiencies during each period are calculated with respect to each of the parameters analyzed. Data on oxygen uptake were collected. Sludge filterability at the Skokomish plant was comparable to that of conventional activated sludge plants. The study indicated that the processing of large salmon resulted in lower flow and pollutant concentrations per unit of fish than did small salmon processing. Longer retention times and overaeration resulted in poor clarifier performance and high effluent phosphorus concentrations produced by the release of phosphorus in the aeration tank. (See also W78-02070) (Schulz-FIRL) W78-02071

RECLAMATION AND TREATMENT OF CLAM WASH WATER,
Cornell Univ., Ithaca, NY. Dept. of Food Science.
For primary bibliographic entry see Field 5E. W78-02072

PILOT PLANT PRODUCTION OF A FUNCTIONAL PROTEIN FROM FISH WASTE BY ENZYMIC DIGESTION,
Washington Univ., Seattle. Inst. for Food Science and Technology.

G. O. Bucove, and G. M. Pigott.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. P 67-82, 6 fig, 4 tab, 17 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Enzymes, *Proteins, *Waste disposal, *Food processing industry, *Fish handling facilities, Pilot plants, Recycling, Feeds, Industrial wastes, Waste water treatment, Protein recovery, Enzymatic digestion, Non-fat dry milk substitutes.

At most only 65% of the available protein in fish caught annually is processed for human consumption, while the remainder is used for low grade animal feed or disposed as wastes. A biological enzyme process to digest fish protein was evaluated for the production of a soluble, high-quality protein product to be used as a mild solids substitute in animal feed or as a human food additive. The whole fish or fish waste is deboned and homogenized before passing to an enzyme reactor where pepsin is added to the water-fish slurry. The mixture is centrifuged to remove sludge and oil. Sodium hydroxide is added to the mixture in an anion conversion reactor to remove salts and the mixture is again centrifuged. After neutralization, the mixture is concentrated and spray dried to produce a white, fluffy powder which contains about 85% protein. Costs for the process are estimated at \$0.80/lb as compared with current prices of \$0.60/lb for non-fat milk solids which contain only 35% protein. (See also W78-02070) (Schulz-FIRL) W78-02073

AN IMMOBILIZED-ENZYME PILOT PLANT FOR THE TREATMENT OF ACID WHEY,
Lehigh Univ., Bethlehem, PA. Dept. of Chemical Engineering.

M. Charles, R. W. Coughlin, and K. Julkowski.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. P 83-99, 7 fig, 4 tab, 9 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Enzymes, *Catalysts, *Dairy industry, *Food processing industry, Equipment, Recycling, Adsorption, Porous media, Industrial wastes, Waste water treatment, Lactase, Lactose, Whey.

A fluidized-bed hydrolysis reactor with lactase immobilized on small alumina particles as a catalyst was used in studies at the Lehigh Valley Dairy in Allentown, Pennsylvania, on the hydrolysis of lactose in raw (unfiltered) cottage cheese whey. The smallest practical particle size (50-200 microns) was used with the immobilized-enzyme catalyst since the larger relative particle surface area minimized the reactor size required and increased productivity. The laboratory-scale reactors were 3 ft high, 1 in diameter, and charged with 40 g of the lactase-on-alumina catalyst. The laboratory-scale reactors functioned without mechanical failure and the catalyst was stable throughout the experiment. An initial decay in the apparent catalyst activity was attributed to partially reversible adsorption of whey protein. Pilot plant studies were conducted with two 6-ft high, 3 in diameter hydrolyzers which contained approximately 4 kg of catalyst. Optional prehydrolysis treatment with either ultrafiltration or demineralization was added to the treatment process. Pilot plant operations resulted in a minimum lactose conversion of 70%. Total capital and operating costs for the system were estimated at \$0.15/lb whey solids. Based on the cost of waste treatment, whey protein, and sucrose, a return investment of 68% for a 300 day/yr operation or \$5.85/lb whey solids is predicted. (See also W78-02070) (Schulz-FIRL) W78-02074

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IN-PLANT CONTROL TECHNOLOGY FOR THE FRUITS AND VEGETABLES PROCESSING INDUSTRY.

SCS Engineers, Long Beach, CA.
K. V. LaConde, and C. J. Schmidt.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 100-109, 2 fig, 1 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Surveys, *On-site data collections, *Fruit crops, *Vegetable crops, *Flow control, Design data, Operation and maintenance, Industrial wastes, Waste water treatment, Food processing industry, Carrot processing, Fruit and vegetable processing industry.

An EPA-sponsored project conducted by SCS Engineers of Long Beach, California, included a survey of approximately 500 fruit and vegetable processing plants to obtain information on basic manufacturing processes, unit operations, waste water volume and characteristics, current in-plant practices used to reduce waste water volume and pollutant loading, current treatment technologies, performance efficiencies, alternatives, and costs. Plants which exhibited significantly lower raw waste loads were identified. Various in-plant operations and their potential effect on pollutant loadings were examined. Processes which were identified as having a positive effect in raw waste load reductions included separation of low and high strength waste streams, installation of low-volume high pressure clean-up systems, dry in-plant transport of products, countercurrent reuse of wash/flume/cooling waters, dry handling of solid wastes, dry caustic peeling, changeover from water to steam blanching, air cooling after blanching, and an active and progressive waste management program. A case study on designs to reduce waste water flow at a frozen carrot processing plant is presented. (See also W78-02070) (Schulz-FIRL)
W78-02075

LAND DISPOSAL OF WINERY WASTEWATER,

Montgomery (James M.), Walnut Creek, CA.
L. L. Russell, J. N. De Boice, and W. W. Carey.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 110-117, 2 fig, 3 tab, 5 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Soil disposal fields, *Waste water treatment, *Waste water disposal, *Return flow, Groundwater, Waste water disposal, Artificial recharge, Food processing industry, Industrial wastes, Winery wastes.

Various alternatives were considered in the construction of a waste water treatment and disposal system to accommodate a large new winery at the Beringer Winery in St. Helena, California. The winery generates 50,000 gpd of waste water during the 45-day crushing season and 20,000-30,000 gpd during the non-crushing season. The treatment system chosen for the waste water which usually has a COD of more than 10,000 mg/liter included screening and neutralization prior to disposal in seven percolation beds. Hydrologic and soils studies used to evaluate the feasibility of percolation beds included soil percolation studies, permeability studies, a computer simulation of the biological and chemical reactions that occur in soil, dispersion analysis, and studies on the effects of the discharge on the Napa River. The studies indicated that land disposal was capable of providing a high level of treatment at low capital and operating costs. Problems associated with odors, gnats, and anaerobic conditions could be controlled at low application rates. Studies to characterize the winery's waste waters included analyses of samples taken automatically every 1.5 hrs and 6-hrs composite samples for hardness, calcium, TDS, COD, TKN, alkalinity, pH, conductivity, and odor. To comply with stipulations of the discharge permit, a groundwater quality monitoring program was instituted. (See also W78-02070) (Schulz-FIRL)

W78-02076

LOW WASTEWATER POTATO STARCH/PROTEIN PRODUCTION PROCESS - CONCEPT, STATUS, AND OUTLOOK.

Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
J. R. Rosenau, L. F. Whitney, and R. A. Elizondo.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 118-128, 5 fig, 12 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Protein, *Food processing industry, *Water consumption, *Potatoes, Recycling, Proteins, Separation techniques, Industrial wastes, Waste water disposal, Waste disposal, Potato starch.

A process for the production of starch, feed grade protein meal, and pulp from cull potatoes with minimum generation of waste water is described. In the process potatoes are ground and the slurry, wet-sieved with recycled juice, is pumped to a liquid cyclone to remove the starch from the pulp. The starch-rich underflow is dewatered and washed on a belt vacuum filter to remove the residual juice. The starch-free overflow is recycled back to the liquid cyclone and pumped into the tangential elutriation inlet. The recycled juice, which contains 4% solids and 50% protein, can be further treated with ultrafiltration or heat- and acid-induced precipitation. This treatment concentrates and fractionates juice solids to recover the available protein for use as an animal feed supplement. The process requires 25 lb of water per 100 lb of potatoes processed. At current prices and a cost of \$0.75/cwt of cull potatoes, the total value of the recovered products is estimated at \$1.86/cwt with \$0.98/cwt left to cover profit, capital costs, and operational expenses. (See also W78-02070) (Schulz-FIRL)
W78-02077

TOMATO FLUME WATER RECYCLE WITH OFF-LINE MUD REMOVAL,

Eutek Process Development and Engineering, Sacramento, CA.
G. E. Wilson, W. R. Rose, and J. Y. C. Huang.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 157-188, 6 fig, 11 tab, 6 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Water consumption, *Water utilization, *Water reuse, *Operation and maintenance, Flocculation, Coagulation, Suspended solids, Food processing industry, Tomatoes, Costs, Water conservation, Industrial wastes, Canneries, Waste water treatment, Tomato processing.

The objective of the project which was jointly sponsored by the EPA and the National Canners Association was to demonstrate an in-plant water recycle system with off-line mud removal, which could result in approximately 50% savings in the total annual wastes water-related costs in the tomato processing industry. The system installed at a 35-ton/hr plant included a solids trapping false bottom, an ejector for solids transport, a screen with screenings discharge hopper, a soil solids separating swirl concentrator, a sludge thickener, and a chemical coagulation-flocculation system. The system was operated in four modes: conventional cleaning, conventional cleaning with water recycle, disc cleaner, and disc cleaner with recycle and chemical coagulation-flocculation. Use of the disc cleaner and water recycle system increased the daily average tonnage of tomatoes processed because solids did not accumulate in the dump tank and impair product flow. Measurements of water consumption and total solids balance revealed a 26% decrease in the average total daily water usage with use of the disc cleaner with water recycle and chemical flocculation. A breakdown of water consumption indicated that approximate-

ly 7% was used for filling, 55% for operational purposes, and 39% for clean-up. (See also W78-02070) (Schulz-FIRL)
W78-02078

PROTOTYPE APPLICATION OF SINGLE PARAMETER SLUDGE AGE CONTROL TECHNOLOGY - A CASE HISTORY - PERFORMANCE OPTIMIZATION BY APPLICATION OF SLUDGE AGE CONTROL TO EXTENDED AERATION TYPE TREATMENT PLANT FOR FOOD PROCESS WASTES,

Brown-Devlin Associates, West Seneca, NY.
C. G. Brown.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 189-236, 14 fig, 15 tab, 13 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Prototype tests, *Model studies, *Food processing, *Design data, *Sludge treatment, Monitoring, Operation and maintenance, Treatment facilities, Clarification, Aeration, Industrial wastes, Waste water treatment, Sludge age control, Frozen food processing.

The application of the single control parameter of sludge age to an existing conventional activated sludge plant was demonstrated at a frozen food processing plant in western New York. The program included monitoring of production, water use, and waste water flow and constituents. The existing treatment plant facilities and operating conditions are described. Operating conditions before and after the initiation of sludge control are compared. A 7-day test period was used to identify problems and establish operating parameters for a longer study of the system. After a 34-day testing period, a final design was developed which incorporated raw waste rough screening, a revised air flotation system, conversion of the existing final settling tank to an aeration tank, a larger and deeper clarifier, and a multi-media filter following the clarifier at an estimated total construction cost of \$425,000. (See also W78-02070) (Schulz-FIRL)
W78-02079

CONTROL OF COLOR PROBLEMS DURING RECYCLING OF FOOD PROCESS WASTES, Manitoba Univ., Winnipeg. Dept. of Food Science.

A. Hydamaka, P. Stephen, R. A. Gallop, and L. Carvalho.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 237-256, 11 fig, 16 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Color, *Food processing, *Potatoes, *Enzymes, *Analytical techniques, Chemical reactions, Activated carbon, Hydrogen ion concentration, Water reuse, Industrial wastes, Potato processing industry, Potato discoloration control.

Problems associated with on-site treatment of potato processing waste water or discharge of potato processing wastes to municipal sewer systems have given rise to a closed-loop recycle system for potato rinsing as well as to methods for treatment and recovery of rinse water constituents. Control of enzymatic browning of potato tissue as a result of phenol hydroxylase or creasease activity and polyphenol oxidase or catecholase activity is discussed with respect to closed-loop cyclic systems in potato processing. Activated carbon was evaluated as a means of controlling 'browning' with respect to the activity of polyphenol oxidase enzyme and the level of hydroxylated aromatic compounds (tannin) present in the rinse water before and after treatment. During the studies, rinse water from the processing of french fry slices was centrifuged, filtered, and treated with 0.10%, 0.30% or 0.50% dosages of powdered carbon. A carbon dosage of 0.10% was considered insufficient to control enzyme activity over several cycles but was capable

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of significantly lowering both tannin and enzyme activity. At 0.30% the enzyme and substrate accumulation rate was decreased, and at a dosage of 0.50% residual enzyme activity was not detected up to and including the fifth cycle. The use of citric acid to lower the pH of the rinse water to approximately 5.5 held the use of citric acid to lower the pH of the rinse water to approximately 5.5 held the enzyme activity at a constant level but did not affect the tannin concentration. (See also W78-02070) (Schulz-FIRL)
W78-02080

THE TOXICITY OF FOOD PROCESSING EFFLUENTS TO FISH

Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate. For primary bibliographic entry see Field 5C.
W78-02081

CHARACTERIZATION AND POTENTIAL METHODS FOR REDUCING WASTEWATER

Mayer (Oscar) and Co., Madison, WI.
D. L. Grothman, L. J. P. Scully, P. M. Berthouex, and D. O. Dencker.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 273-297, 6 fig, 8 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Water conservation, *Food processing industry, *Hogs, *Water utilization, Industrial water, Industrial wastes, Monitoring, Sampling, Water pollution control, Oily water, Biochemical oxygen demand, Waste water treatment, Meat processing wastes, Waste water reduction.

An Oscar Mayer and Company meat processing plant in Madison, Wisconsin, was the site of a study to determine the waste load from different hog slaughtering processes, to characterize waste stream, and to develop process changes which would reduce water use and waste water production and prevent product loss to sewers. Hog slaughtering processes for the 1000-head/hr plant are described. As part of the monitoring program, waste water grab samples were collected at various stages of the slaughtering process and analyzed for BOD, COD, organic carbon, grease, solids, and total Kjeldahl nitrogen. Flow monitoring and analyses indicated that approximately 33% of the water use and 5% of the BOD load originated during the clean-up phase, while 66% of the water use and 95% of the BOD loading occurred during the production shift. Process changes which were recommended to reduce waste water flow by 41% and reduce BOD and suspended solids by 63% are described. (See also W78-02070) (Schulz-FIRL)
W78-02082

POULTRY PROCESSING WASTEWATER-ADVANCED TREATMENT AND REUSE

D. T. McGrail.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 298-307, 1 fig, 8 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Water reuse, *Recycling, *Tertiary treatment, *Poultry, *Food processing industry, Disinfection, Flocculation, Effluents, Industrial water, Waste water treatment, Poultry processing waste water.

Advanced treatment and recycling of poultry processing waste water were evaluated at the 6,000-bird/hr Sterling Processing Corporation in Oakland, Maryland. The project was initiated because limited water resources in the area could not meet processing requirements even after strict conservation measures have been taken. The project included a sampling program to characterize the 300,000 gpd of raw waste water with respect to

BOD, TSS, and oil and grease. The lagoon system which received waste water before it passed to the advanced treatment plant included two aerated lagoons which removed 93% of the BOD, 96% of the grease, and 79% of the suspended solids in the raw waste water. The advanced waste water treatment process included microstraining, flocculation and sedimentation, and sand filtration. The microstrainer, designed to handle an average BOD of 15 ppm, suspended solids of 60 ppm, and grease of 8 ppm, was not efficient during extreme weather conditions. Laboratory tests conducted to determine the optimum dosages of alum, lime, and a polyelectrolytic coagulant for flocculation and sedimentation suggested dosages of 100 ppm alum, 35 ppm lime, and 1 ppm of HERCOFLOC, a slightly anionic coagulant. Flocculation and sedimentation resulted in BOD removals of 80% and suspended solids of 70%. The sand and gravel gravity filtration which followed flocculation was capable of producing an effluent of potable quality. Disinfection is accomplished by chlorination at a rate of 10 ppm, after the second lagoon and again after the sand filtration. (See also W78-02070) (Schulz-FIRL)
W78-02083

ALTERNATIVES FOR TREATING POULTRY PROCESSING WASTEWATER

F. E. Woodard.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 308-330, 7 fig, 6 tab, 7 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Water reuse, *Tertiary treatment, *Poultry, *Food processing industry, *Industrial wastes, Industrial water, Filtration, Activated carbon, Biological treatment, Water conservation, Separation techniques, Waste water treatment, Costs, Poultry processing wastes.

Performance and feasibility of various alternatives for pollutant reduction available to the poultry processing industry are discussed. Typical poultry processing operations, waste water sources, and flow and pollutant loading are described. Proposed NPDES effluent guidelines for poultry processing wastes based on live weight killed (LWK) include a BOD of 0.46 lb/1000 lb LWK, suspended solids of 0.62 lb/1000 lb LWK, and grease of 0.20 lb/1000 lb LWK. Three alternatives for reducing the discharge of pollutants from poultry processing plants are presented. The first includes chemical coagulation and dissolved air flotation of the combined waste flows, followed by tertiary treatment with sand filtration and activated carbon to meet NPDES standards. The second alternative involves effluent flow reduction through process changes to replace water-using steps such as chilling and viscera removal with dry processes. The third alternative involves physico-chemical treatment with screening, chemical coagulation, dissolved air flotation, sand filtration, activated carbon adsorption, and disinfection to allow reuse of water for each individual process. Results of technical feasibility studies and cost analyses for the alternatives are presented. (See also W78-02070) (Schulz-FIRL)
W78-02084

PROCESSING EGG BREAKING PLANT WASTE

Missouri Univ.-Columbia.
J. M. Vandepopeliere, H. V. Walton, W. Jaynes, and O. J. Cotterill.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 331-337, 4 fig, 2 tab, 2 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Poultry, *Waste disposal, *Salmonella, *Food processing industry, *Industrial wastes, Equipment, Costs, Disinfection, Microorganisms, Dewatering, Waste treatment, Waste disposal, Egg breaking plant waste, Egg shells.

Disposal by conventional means, in landfills or farm land pastures, of the 50,000 tons of waste produced at approximately 150 egg breaking plants has been considered as posing potential pollution problems. Results of a pilot program conducted at a commercial egg breaking plant by the EPA and the Missouri Agricultural Experiment Station are presented. Dehydrating and cooking of egg breaking wastes were investigated with a Heil SD 45-12 triple pass rotary drum dehydrator installed in-line at the plant. A shell spin and a liquid egg separator were installed to separate the liquid from inedible eggs. Wet egg shells and dried egg shell meal were combined in a dehydrator which was equipped with a cyclone collector and diverter to regulate the amount of dehydrated egg shell meal that would be returned to the blending operation. Salmonellae counts indicated that the wet egg shell waste contained approximately 1.79 million microorganisms per gram while the dehydrated samples were salmonella-negative. Installation costs for the dehydrator are estimated at \$35,000 with combined ownership and operating expenses ranging from \$13.40 to \$16.79 per ton of dried egg shell meal. The estimated feed value of egg shell meal was projected at \$35.00 per ton. (See also W78-02070) (Schulz-FIRL)
W78-02085

TREATMENT OF PACKINGHOUSE WASTEWATER BY SAND FILTRATION

East Central Oklahoma State Univ., Ada. School of Environmental Science.
M. L. Rowe.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 356-366, 4 fig, 7 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Tertiary treatment, *Filtration, *Pilot plants, *Aeration, *Oxidation lagoons, Filters, Treatment facilities, Industrial wastes, Waste water treatment, Porous media, Food processing industry, Suspended solids, Design data, Sand filters, Packinghouse waste water.

Intermittent sand filter treatment for packing house waste water was evaluated in pilot studies at the W. E. Reeves Packing Company in Ada, Oklahoma. Two pilot-scale filter units were constructed adjacent to the existing extended aeration and secondary stage lagoons. The filter units received waste water from the lagoon system at a rate of equivalent to 0.5 million gal per acre per day. The units were filled with 18 inches of gravel ranging from 1.25 inches in diameter at the bottom of the filter to 0.25 inches at the top, and were covered with 36 inches of sand at a diameter of 0.2 mm. The units were constructed with clay embankments with a 2.5:1 slope on three sides and a common concrete wall separating the two units on the fourth side. Each filter was equipped with a underdrain network of 5 inches diameter perforated pipes. Construction costs for the unit were \$12,850. Clogging after only 2 days of operation of the filter units was attributed to sludge accumulations produced by loading rates in excess of the filter capacity. After cleaning to remove the 16,000 gal of sludge accumulated in the bottom, the filters were again put into operation and clogged within 4 days. Further investigations revealed that aeration in the lagoon system during the 4-hr loading period increased the amount of sludge loaded onto the filters. After correction of problems caused by aeration timing, the settling time in the lagoon was increased and the filters performed properly with average BOD and suspended solids values in the effluents of 8 and 12 mg/liter, respectively. (See also W78-02070) (Schulz-FIRL)
W78-02086

WASTE TREATMENT FOR SMALL MEAT AND POULTRY PLANTS

Industrial Environmental Research Lab.-Cincinnati. Corvallis, OR. Food and Wood Products Branch.
J. L. Witherow.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976, p. 367-409, 10 fig, 7 tab, 35 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Food processing industry, *Design criteria, *Costs, *Oxidation lagoons, *Aeration, Treatment facilities, Poultry, Construction materials, Effluents, Water quality standards, Aerobic treatment, Operation and maintenance, Industrial wastes, Poultry processing waste water, Meat processing waste water, Extended aeration lagoons.

Various aspects related to waste water treatment for small meat and poultry processing plants are reviewed with respect to five steps in solving a waste water problem: preliminary design, funding, detailed design, construction, and operation. Preliminary design involves the selection of in-plant controls, treatment processes, and site in an effort to supply adequate treatment while minimizing costs. Discharge and monitoring regulations are discussed with respect to slaughterhouses, packinghouses, and chicken and fowl processors. In-plant methods for waste reduction are described as means of reducing flow volume and quantity of pollutants which contribute to waste water treatment costs. Methods of sampling and analysis to characterize waste water and define treatment requirements are presented. Considerations in site selections are evaluated. Various treatment processes are appraised for use in small meat and poultry processing plants, including anaerobic lagoons, aerobic lagoons, extended aeration lagoons, aerated lagoons, intermittent sand filtration, land application, and disinfection. Types of funding and methods for calculating relative costs are presented. Location, size and shape, dikes, inlets and outlets, and aeration equipment needs are discussed with respect to the development of detailed designs for lagoon systems. Guidelines for the various phases in construction of a lagoon system are presented. (See also W78-02070) (Schulz-FIRL) W78-02087

EVALUATING AND TREATING POULTRY PROCESSING WASTEWATER

Richard B. Russell Agricultural Research Center, Athens, GA.

W. K. Whitehead.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976, p. 410-431, 10 fig, 3 tab, 9 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Poultry, *Industrial wastes, *Activated sludge, *Oxidation lagoons, *Food processing industry, Sludge treatment, Pilot plants, Monitoring, Sampling, Waste water treatment, Poultry processing wastes.

Studies were conducted to define sources, quantities, and characteristics of waste water generated in a poultry processing plant; to evaluate an existing poultry waste lagoon treatment system; and to design and operate a conventional activated sludge system for poultry processing wastes. The first phase of the project included analyses of BOD, COD, TOC, fat, total and volatile solids, and total and volatile suspended solids in waste water collected at a plant processing 9600 broilers/hr. The second phase of the program involved monitoring of a 4-stage lagoon process, with aeration in the first two ponds, at a poultry processing plant which handled 90,000 broilers/day and discharged 3.5 million gal of waste water/wk. The laboratory-scale activated sludge system which was designed and operated in the study included a reactor and a solids-liquid separator. The system was operated at a feed rate of 28 liter/day, a hydraulic detention time of 6 hrs, and sludge ages of 1, 2, 3.5, 7, 10, and 14 days. The system was capable of removing 93% of the COD and more than 90% of the suspended solids and fat. (See also W78-02070) (Schulz-FIRL) W78-02088

A MEAT PACKER'S SOLUTION TO MEETING 1983 EFFLUENT REQUIREMENTS

Foth and Van Dyke and Associates, Inc., Green Bay, WI.

J. A. Homel, Jr. and J. McVaugh.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976, p. 432-449, 2 fig, 8 tab, 3 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Activated sludge, *Food processing industry, *Nutrient removal, *Phosphorus, *Treatment facilities, Coagulation, Flotation, Return flow, Soil-water-plant relationships, Costs, Industrial wastes, Waste water treatment, Meat-packing wastes.

Hillshire Farm Inc. in New London, Wisconsin, was required in 1972 by the state of Wisconsin to reduce BOD and SS to maximums of 35 mg/liter and reduce total phosphorus by 85% in waste water generated during the slaughter and processing of 1500 hogs/day. Costs for connection to the municipal waste treatment system were projected at \$680,000-750,000 with yearly sewage surcharge fees of \$25,000. A program for flow monitoring and waste water sampling was initiated to examine possible methods of on-site waste water treatment for stream discharge. Waste water treatment facilities chosen for Hillshire Farm included a rotary screen for kill flow wastes, a lift station, dissolved air flotation, completely-mixed activated sludge, chlorine contact, and final detention in a pond filled with marsh vegetation. A sampling program conducted to evaluate process performance indicated that overall removal efficiencies were 99% for BOD, 98% for SS, 70% for phosphorus, and 98% for oil and grease with actual marsh effluent concentrations of 7, 8, 7, and 6 mg/liter, respectively. Studies conducted to examine methods to increase phosphorus removal from 70% to 85% revealed that ferric chloride was more effective than lime or alum for enhancing phosphorus removal. Capital costs for the system, which was installed in 1973, were \$350,000. Annual operating costs have averaged at \$25,000. (See also W78-02070) (Schulz-FIRL) W78-02089

TREATMENT OF MEATPACKING PLANT WASTEWATER BY LAND APPLICATION

Texas Univ. at El Paso. Dept. of Civil Engineering. A. J. Tarquin.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976, p. 470-484, 5 fig, 4 tab, 5 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Return flow, *Application methods, *Infiltration, *Nutrient removal, *Waste assimilative capacity, Waste water disposal, Waste water treatment, Food processing industry, Phosphorus, Oily water, Industrial wastes, Infiltration-percolation, Overland flow.

Land application has been used to remove residual carbon, phosphorus, and nitrogen from a wide variety of municipal and industrial wastes. Major types of land application systems include irrigation, overland flow, and infiltration-percolation. Results of pilot scale studies on land application for meatpacking wastes conducted at the Peyton Meatpacking Plant in El Paso, Texas, are presented. Effluent concentrations from the catch basin of the Peyton Packing Plant are presented. Site characteristics which may influence the feasibility of land application include climate, soil, topography, groundwater, and vegetation. Design considerations such as loading rates, operating pressure, and monitoring are discussed. Treatment efficiencies for the infiltration system at the Peyton Packing Plant were 100% for grease, 99% for COD, 72% for nitrogen, and 100% for SS at an application rate of 2.5 in/wk and 100%, 98%, 58%, and 100%, respectively, for 4 in/wk. Removal efficiencies with overland flow treatment were 84% for COD, 44% for Kjeldahl nitrogen, 54% for total

solids, 76% for volatile total solids, 87% for suspended solids, and 89% for volatile suspended solids. (See also W78-02070) (Schulz-FIRL) W78-02090

ZINC SLUDGE RECYCLING AFTER KASTONE TREATMENT OF CYANIDE-BEARING RINSE WATER

Metal Plating Corp., Connerville, IN.

J. G. Moser.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 929, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-038, February 1977. 38 p, 4 fig, 2 tab, 6 append.

Descriptors: *Zinc, *Nitrogen compounds, *Sludge digestion, *Metals, Recycling, Sludge treatment, Chemical precipitation, Industrial wastes, *Waste water treatment, Cyanide, Plating wastes.

The DuPont Company's Kastone process for recycling of zinc sludge from rinse waters in metal finishing processes was evaluated in pilot studies at the Metal Plating Corporation in Connerville, Indiana. In the process the cyanide-zinc rinse with 500-5000 mg/liter NaCN is treated with formalin and a patented Kastone peroxygen compound which contains about 41% hydrogen peroxide, special stabilizers, and flocculants. The free cyanide produces a combination of ammonia, sodium cyanate, and glycolic acid amide and the zinc is precipitated as zinc oxide. After the zinc oxide sludge is removed, it is dissolved in a quantity of plating solution, filtered to remove any insolubles, and fed to the original zinc plating bath. The study concluded that recycling of zinc oxide sludge extracted from cyanide-zinc rinse water was feasible if equipment was scaled and designed to minimize labor, sludge was handled on a daily basis, bag filtration was used, dragout was minimized, and the water was treated to eliminate insolubles. Daily recycling costs were \$27.96 for treatment, \$15.00 for recycling, and \$18.45 for storage and transport of zinc sludge with a daily saving in zinc costs of \$11.90. (Schulz-FIRL) W78-02091

ANALYTICAL VARIABILITY OF FIVE WASTEWATER PARAMETERS - PETROLEUM REFINING INDUSTRY

Robert S. Kerr Environmental Research Lab., Ada, OK.

For primary bibliographic entry see Field 5A. W78-02092

FRUIT CANNERY WASTE ACTIVATED SLUDGE AS A CATTLE FEED INGREDIENT

Bovay Engineers, Inc., Spokane, WA.

For primary bibliographic entry see Field 5E. W78-02093

DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES

Cornell Univ., Ithaca, NY.

J. H. Martin, and R. C. Loehr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 351, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-186, October 1976. 164 p, 38 fig, 38 tab, 67 ref, 1 append.

Descriptors: *Farm wastes, *Poultry, *Aeration, *Oxidation lagoons, *Farm lagoons, Pilot plants, Odor, Costs, Chemical oxygen demand, Nitrification, Sludge treatment, Industrial wastes, Waste water treatment, Poultry wastes, Odor control.

Full-scale studies at Manorcrest Farms in Camillus, New York, were used to evaluate the use of aerobic biological treatment systems for air and water pollution control for poultry wastes under commercial conditions. Design and operating

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

guidelines for commercial applications were also developed. For study purposes, four existing manure collection pits in the bird house at Manorcrest Farms were converted to two oxidation ditches, each serving 4,000 birds. A steady state process with a constant SRT and low mixed liquor total solids concentrations was chosen as the operating mode for the oxidation ditches. Liquid solids separation via gravity settling for solids removal was chosen over the creation of a continuous flow system by water addition. Raw waste samples were analyzed for total manure production per bird-day, total solids, volatile solids, COD, and TKN. Mixed liquor and settling tank supernatant were analyzed for total solids, volatile solids, COD, TKN, ammonia-N, nitrite-N, nitrate-N, pH, temperature, and DO. Oxygen transfer studies conducted to establish baseline oxygen transfer data and to evaluate the brush aerator-propeller combination as an alternative aeration approach indicated that oxygen transfer in the first ditch was 527 g O₂/hr or 132 g O₂/1000 bird-hrs, and 3360 g O₂/hr or 840 g O₂/1000 bird-hrs in the second ditch. Problem areas in the design and operation of aeration systems were associated with sediment accumulation, foaming, feathers, and excess water. (Schulz-FRL) W78-02094

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY, Black and Veatch, Kansas City, MO.
For primary bibliographic entry see Field 5G.
W78-02096

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPAL WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-02104

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 024. Price codes: A07 in paper copy, A01 in microfiche. EPA 904/9-76-018. June 18, 1976. 544 p. C370344.

Descriptors: *North Carolina, *Interceptor sewers, *Streams, *Environmental effects, *Sewage disposal, *Septic tanks, *Odor, *Grants, *Project planning, *Alternate planning, *Erosion, *Sedimentation, *Floods, *Environmental control, *Vegetation effects, *Environmental sanitation, *Waste water treatment, *Water supply, *Flood control, *Storm runoff, *Environmental impact statement, *Environmental Protection Agency.

The Environmental Protection Agency has prepared a Final Environmental Impact Statement on the awarding of grant funds to Wake County, North Carolina for the preparation of plans and specifications for the construction of an interceptor line to service the upper drainage basin of Crabtree Creek. The project area is a patchwork of agricultural lands, forest, bottom land vegetation and suburban and urban development. The main beneficial impacts are the establishment of a regional waste water collection system, the elimination of future waste water discharges into natural creeks and the discontinuance of septic tanks use. The primary adverse impacts of the project are construction erosion and sedimentation, alteration and destruction of vegetative ecosystems, possible destruction of archeological historical sights and

odor emanations. The secondary adverse impacts include the possibility of flooding, developmental erosion and sedimentation, and an increased demand for community services. The proposed project will cause irreversible and irretrievable expenditures of certain labor, material, land and community resources. Project alternatives include no action, alternative routing of interceptors, and a reduction in the scope of the project. The 'no action' alternative would result in inadequate regional wastewater treatment. (Curran-Florida) W78-02107

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION 4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972.
Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-02108

VORTEX COAGULATION MEANS AND METHOD FOR WASTEWATER CLARIFICATION,
Swift and Co. Ltd., Chicago, IL. (Assignee).
E. R. Ramirez, and D. L. Johnson.
U.S. Patent No. 4,031,006, 14 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1228, June 21, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Sewage wastes, *Water pollution treatment, *Water quality control, Separation techniques, Coagulation, Vortices, Rotational flow, Bubbles, Packing plant wastes.

Raw wastewater to be clarified is routed in an apparatus which directs the wastewater in an upward directed vortex path that is above and open to a source of dense microbubbles. Impurities within the wastewater are urged toward the periphery of the vortex and coagulate, while the bubbles tend to pass up through a central core of the vortex. The coagulated impurities and the bubbles approach the outlet of the vortex apparatus, whereupon a venturi-like effect is developed to accomplish an improved contacting of the coagulated impurities and the bubbles to form buoyant agglomerates. The wastewater and buoyant agglomerates flow together through the vortex outlet, after which the buoyant agglomerates may be permitted to float to the surface of the wastewater in a separate chamber. (Sinha-OEIS) W78-02129

SLOP OIL TREATING SYSTEM,
Cities Service Oil Co., Tulsa, OK. (Assignee).
A. V. Sierra, Jr.
U.S. Patent No. 4,031,007, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1228, June 21, 1977.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, *Oil wastes, *Oily water, *Industrial wastes, *Separation techniques, *Water quality control, *Water pollution treatment, *Oil-water interface, *Equipment, *Slop-oil treatment.

Slop oil treatment is most typically found in a petroleum refinery, but this invention can also be applied in the treatment of used railroad oil or in the recovery of cutting oils used in a steel plant. One procedure is to add the slop oil-water mixture to the coalescer, along with emulsion-breaking chemicals. Under the influence of the direct current electric field in the coalescer, the emulsion breaks, giving an oily top layer and an aqueous bottom layer. This invention comprises employing a probe that produces a signal when the interface between the oil and water layers approaches a predetermined level in the coalescer, and employing vertically-placed extensions on the bottoms of at

least two of the coalescer plates. The probe is used to detect and warn of the troublesome interface emulsion. The plate extensions are used as additional warning devices, so that operating conditions in the coalescer can be altered to move the level of the troublesome interface emulsion away from the coalescer plates. The combinations of these two devices allows continuous operation of the slop oil treatment system. (Sinha-OEIS) W78-02130

REMOVAL OF GREASE AND OIL FROM PARTICULATE BED GRANULES BY BACKWASHING WITH A DETERGENT,
Sterling Drug Inc., New York. (Assignee).
D. S. Ross.
U.S. Patent No. 4,032,443, 10 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1706, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Oil wastes, *Slime, *Filtration, *Suspended solids, *Detergents, *Cleaning, *Backwash.

Waste treatment plant effluent containing significant amounts of colloidal or coalesced grease add a new and difficult dimension to the waste water filtration process. This tenacious grease film will cause the very fine media to adhere together forming clumps that block passage of air or water. This grease film will also cause media grains to attract and hold suspended solids to the grain surface, the film acting as a binder with other grains to block flows of air and water in all directions. This invention is directed toward a waste effluent filter of the type utilizing a particulate filter bed and an underdrain structure. The improvement comprises means to force chemical cleaning solution into the underdrain cavity to force water into the underdrain cavity mixing the cleaning solution with water and forcing the admixture of cleaning solution and water upward into the particulate media following the complete evacuation of air previously trapped in uniformly spaced compartments. The flow of cleaning solution into the media can be stopped to permit the media to soak in cleaning solution. Jet augers are created for short periods followed by additional soaking to completely emulsify the grease film on each media grain. The emulsified grease is then backwashed from the particulate media. (Sinha-OEIS) W78-02135

SEALED SEWAGE EJECTOR ASSEMBLY,
Marten's (D) Mfg. Co. Ltd., Winnipeg (Manitoba). (Assignee).
U.S. Patent No. 4,032,448, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1708, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Septic tanks, *Soil disposal fields, *Domestic wastes, *Waste disposal, *Water pollution sources, *Equipment.

Conventional sewage discharge systems from septic tanks and the like often drain into the sub-surface soil, particularly when the cycle stops as the discharge pipe drains at this point in order to prevent freeze-up occurring cold weather. In areas of high water tables and pervious soils, there is always the possibility of pollution occurring to the water supply. This invention incorporates a totally enclosed ejector assembly having an outer riser pipe with a cone-shaped base. The cone-shaped base is connected to the plastic discharge pipe from the sewage pump. A venturi assembly forming part of the discharge pipe, sits into the seat of the cone-shaped base and a small diameter pipe extends upward forming the remainder of the discharge pipe. When the pump stops, the small diameter discharge pipe drains back into the sealed outer riser pipe or standpipe and on the next pumping cycle, the venturi assembly drains the outer riser pipe or standpipe thus providing frost-

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free surface discharge of all effluent with any sub-surface seepage. (Sinha-OEIS)
W78-02136

EFFLUENT TREATMENT PROCESS,
British Petroleum Co., Ltd., London (England). (Assignee).
G. F. Oldham.
U.S. Patent No. 4,032,439, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1704, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Oil pollution, *Oily water, *Water pollution treatment, *Filtration, Filters, Biological treatment, Sands, Refinery effluent, Percolating biological filters.

This invention relates to a method for treating effluent water contaminated with petroleum and petroleum products, particularly from oil refineries. A method has been devised for treating refinery effluent which enables an oil content of below 5 mg/litre to be achieved without a flocculation stage, which avoids the need for an incinerator and which can be used on almost all refinery and similar effluents. The method comprises passing the effluent water first through a sand filter and subsequently through a biological percolating filter. Reversal of the order of the stages is not a satisfactory or effective method. Biological percolating treatment after sand filtration can be adequate to achieve the required oil and BOD levels and is superior in some respects to an activated sludge treatment. Biological percolating filters have been found to have advantages over activated sludge plants such as a greater resistance to shock load especially alkali because of the neutralising action of the high CO₂ concentrations towards the top of the filter bed, good oxidation of ammonia in the lower levels and temperature reduction of warm effluents. The term biological percolating filter includes submerged and partly submerged biological percolating filters. (Sinha - OEIS)
W78-02142

PROCESS FOR RECOVERY OF SELECTED METAL VALUES FROM WASTE WATERS,
World Resources Co., McLean, VA. (Assignee).
M. Markels, Jr.
U.S. Patent No. 4,033,763, 10 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 275, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, Water pollution treatment, Metals, Separation techniques, Sludge, Sewage bacteria, Incineration, Precious metal recovery.

A process is described for recovering selected metal values from waste waters using sewage type bacteria to imbibe and capture and concentrate the metal values in a sludge, followed by de-watering and burning off the sludge to eliminate organic matter and to further concentrate the metal values, and then treating by pyrometallurgical or hydrometallurgical steps to recover the desired metals in a sludge, with the step of burning off the sludge to eliminate organic matter and to further concentrate the metal values, and then treating by pyrometallurgical or hydrometallurgical steps to recover the desired metals. The invention couples the step of capturing and immobilizing the trace metals in a sludge, with the step of burning off the organic component and with the steps of a conventional metal-winning process to purify and recover captured selected metals, particularly precious metals. The efficiency of the combined process is such as to permit the economic recovery of precious metal values from waste waters which also contain a very wide variety of organic and inorganic matter, including undesired metal values appearing as contaminants in the water. (Sinha - OEIS)
W78-02147

CHROMATE REDUCTION IN AQUEOUS MEDIUM,
Betz Labs., Inc., Trevose, PA. (Assignee).
D. F. Jacques, and K. R. Lange.
U.S. Patent No. 4,033,867, 4 p, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water quality control, Cooling water, Chromium, Separation techniques, Chemical precipitation, Cation exchange.

Chromate treatments have been used for some years in the control of corrosion, deposition, scaling and general fouling in industrial cooling water systems. This invention is concerned with reducing or removing chromates from the effluent waters. Water containing an undesirably high level of chromate ion is lowered to a pH level of from near zero to 2.8, then is passed through a catalytic reduction column where it is contacted with hydrogen in the presence of a hydrogenation catalyst, such as palladium or platinum, to reduce the chromate ion to the trivalent chromic ion, then is raised to a pH of from about 3.5 to 4.0, then is either passed through a calcium-form cation exchange resin column to remove the chromic ion, or is sent to a precipitation area where the pH is raised to a high level to settle out the chromium as chromium as chromium hydroxide. Residual chromium levels as Cr+3 of 0.5 to 1 ppm are obtained with ion exchange. If essentially zero discharge is desired, a limestone polishing step may be added. (Sinha - OEIS)
W78-02148

METHOD AND APPARATUS FOR PROCESSING CONTAMINATED WASH WATER,
Licentia Patent-Verwaltungs-G.m.b.H., Frankfurt-am-Main (West Germany). (Assignee).
O. Meichner, and H. Queiser.
U.S. Patent No. 4,033,868, 12 p, 2 fig, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water purification, Industrial wastes, Radioactive wastes, Separation techniques, Ion exchange, Filtration, Resins, Nuclear powerplants.

It is a primary object of this invention to provide a method for processing contaminated wash water from nuclear powerplants. This is accomplished by mixing the contaminated wash waters with ion exchange resins in a mixing vessel to form a suspension and then feeding the resulting suspension into a filter. The method thus is a combination of ion exchange and filtration. The usually predominant portion of ionic, radioactive substances is removed from the wash water in the mixing vessel by the ion exchange resin. The solid matter in the wash water is removed from the wash water by being retained on the filter. The wash water leaving the filter is thus freed of both ionically dissolved radioactive contaminants as well as radioactive solids suspended in the wash water. The mixing of the wash water with the ion exchange resins is distinguished from typical ion exchange processes where waste water usually is processed in a straight-through operation. In this invention, the water and ion exchange resin are mixed to form a batch suspension and this suspension is left for a period of time so that the ion exchange resin and water contact each other for a substantial time and a thorough ion exchange is effected. (Sinha-OEIS)
W78-02149

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS,
Universal Oil Products Co., Des Plaines, IL. (Assignee).
For primary bibliographic entry see Field 5F.

W78-02154

PROCESS FOR THE GALVANIC PURIFICATION OF THE WASTE WATERS,
Snam Progetti, S.p.A., Milan (Italy). (Assignee).
N. Mastroioli.
U.S. Patent No. 4,035,269, 7 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 773, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial waste, *Water pollution treatment, Metals, Chemical reactions, Electrochemistry, Oxidation-reduction potential.

This invention refers to a redox process which can be particularly applied to the purification of waste waters. The method removes metals from waste liquids without the use of an externally supplied source of current. The method consists in: (1) immersing in the waste liquid at a pH of less than 3.5, two materials which are different from each other and the metal to be removed, one of the immersed materials being electropositive, the other being carbon or electronegative; (2) connecting the two immersed materials to each other, thus giving rise to an electric current; (3) precipitating the metal or metals to be removed; and (4) recovering the purified waste liquid. (Sinha-OEIS)
W78-02161

PURIFYING TREATMENT FOR EFFLUENTS OF MINERAL OIL DRILLINGS,
Societe Nationale Elf Aquitaine (Production), Courbevoie (France). (Assignee).
M. Guillerme, J. Gratacos, A. Sirvins, and B. Tramier.
U.S. Patent No. 4,035,289, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 777, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Water purification, Drilling fluids, Microorganisms, Microbial degradation, Aerobic conditions, Mineral oil drilling effluents.

An improvement in the anti-pollution treatment of the effluents from mineral oil drillings is provided. It makes possible the suppression of the major part of the BOD of the effluents, which cannot be sufficiently purified by the known physicochemical treatments. The invention consists of subjecting the effluent to the action of microorganisms obtained by the seeding of a portion of this effluent with a strain taken from a microbiological cleansing medium for sewage waters. This preparation of the strains consists in seeding the effluent with microorganisms taken from conventional treatment basins, and breeding generations of these microorganisms in aerated medium, to which are added the nutritive elements lacking in the effluent, particularly compounds of nitrogen and phosphorus. After the time which is necessary for the development of the useful microorganisms the medium which includes the strains thus formed is added to the total volume of the effluent to be treated. The drilling effluents contain clays which it is preferable to eliminate prior to the biological treatment. This flocculation of clays can be carried out at a pH of the order of 5. After separation of the clays, the effluent is subjected to the seeding and culture of the microorganisms. The strain is left to develop while air is continuously dispersed in the liquid. When the BOD has fallen to the required value, the aeration is stopped and decantation is allowed to take place, and the supernatant, purified water is sent into a physicochemical treatment basin. (Sinha-OEIS)
W78-02162

PROCESS FOR TREATING AN ACIDIC WASTE WATER STREAM,
Societe Anonyme Texaco Belgium N.V., Brussels. (Assignee).
A. Benoit, S. A. R. Dewaele, and A. Verhelst.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

U.S. Patent No. 4,035,293, 4 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 779, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Acidic water, *Water pollution treatment, Acid streams, Chemical precipitation, Separation techniques, Neutralization.

A process for converting highly acidic waste water streams to a reusable clarified water effluent and an easily removable precipitate is described. The invention is directed to the treatment of phosphonic acid/phosphoric acid emulsions in water which results from methanol distillations. Such acids can be precipitated by the addition of CaO or Ca(OH)₂ in an amount ranging from 55-93 per cent by weight basis acids at a temperature of 35 to 100°C to a pH of 8 to 12. After removing the precipitated material, the effluent can be neutralized with CO₂ gas. The precipitate can be calcined to tri calcium phosphate. (Sinha-OEIS) W78-02164

SYSTEM FOR POLLUTION SUPPRESSION,
TII Corp., Lindenhurst, NY. (Assignee).
E. T. Armstrong.

U.S. Patent No. 4,035,296, 47 p, 41 fig, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 780, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Water purification, Disinfection, Oxidation, Chemical reactions, Ammonia, Ammonium compounds, Nitrification.

A two stage oxidative system is described for the disinfection of material which may contain nitrogen commonly in the form of ammonia or ammonium as in the treatment of waste or sewage plant effluent. A primary oxidizing agent is added to the effluent to disinfect as well as to lower the pH of the effluent and a secondary oxidizing agent is added to produce a synergistic disinfection system in which the distribution of ammonium and ammonia is shifted to nearly all ammonium. A desirable pH level is 7 or less with desirable primary oxidizing agent including aluminum chloride or ferric chloride with desirable secondary oxidizing agents including chlorine, chlorine dioxide, ozone as in oxygen or air, or sodium hypochlorite. Another aspect of the invention relates to the nitrification of ammonia in the form of secondary effluent from a waste treatment system wherein the ammonia is converted to nitrates in a tertiary unit operation so that the effluent has low ammonia content. (Sinha-OEIS) W78-02165

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.
Reading, PA. USAC Project.
For primary bibliographic entry see Field 3E.
W78-02181

5E. Ultimate Disposal Of Wastes

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
For primary bibliographic entry see Field 5G.
W78-01728

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-01783

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Johns Island, SC.
Bears Bluff Field Station.
For primary bibliographic entry see Field 5G.
W78-01795

GARBAGE - HOW DOES IT AFFECT YOU.
Public Health, Vol. 71, No. 1, p 29-32, January 1977.

Descriptors: *Solid wastes, *Domestic wastes, Organic wastes, *Waste disposal, *New Zealand (Auckland), *Garbage.

A disposal bag collection system for domestic garbage was introduced in Auckland, New Zealand. Public reaction, both positive and negative, were noted. Solutions to the problems that were encountered are offered. Paper and polythene bags are compared. (So African Water Info Center) W78-01824

POLLUTION ESTIMATION FACTORS,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 5A.
W78-01850

GROUND-WATER HYDROLOGY AND SUB-SURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-01869

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS,
Bureau of Mines, Spokane, WA Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W78-01884

TRANSPORT OF DIGESTED SLUDGE SLURRIES FOR ECONOMIC DISPOSAL, MASS TRANSPORT BY PIPELINE TO DISPOSAL OR TO USE FOR STRIP MINE RECLAMATION.
Rand Development Corp., Cleveland, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 675. Price codes: A06 in paper copy, A01 in microfiche. Report prepared for Federal Water Pollution Control Admin., Wash., D.C. November 1966. 94 p, 12 fig, 5 tab, 74 ref, 6 append. PH 86-65-21.

Descriptors: *Project benefits, Sludge disposal, *Slurries, *Water pollution control, *Land reclamation, Transportation, Pipelines, Mining, Strip mines, Sewage treatment, Ohio, Costs, Economics.

Pipeline transport of digested sludge slurries, with disposal and use of the slurry in the restoration of barren areas (e.g., strip mines) provides substantial savings over conventional sewage treatment. Pipeline transport reduces surface water contamination at sewage treatment plant outfalls, and topsoil is generated in stripped areas, which in turn reduces surface water contamination at sewage treatment plant outfalls, and topsoil is generated in stripped areas, which in turn reduces surface water contamination in those areas. Costs per mile are low and essentially do not increase with distance; for example, a city of just over two million producing 590,000 gal of 5% digested sludge slurry per day would incur costs of \$35/ton to vacuum dry and incinerate sludge solids. Pumping 160 mi for disposal without beneficial use would cost \$6/ton of dry solids, compared with \$7.25/ton for transportation and use for land restoration.

The optimum pipeline diameter would be 8 in., with a pumping velocity of 2.6 ft/sec. For a city of 200,000, producing 33,000 gal of 8% digested sludge slurry per day, the cost of vacuum drying and incineration is about \$60/ton; pumping 40 mi without restoration use would be \$7/ton, and with beneficial use \$10.50/ton. This pipeline should be 2.5 in. diameter, with a velocity of 3 ft/sec for slurry diluted to 4%. Field demonstrations near Canton, Ohio, were conducted to assess disposal of digested sludge slurries in acidic strip mine areas. (Lynch-Wisconsin) W78-01890

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMALS WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
For primary bibliographic entry see Field 5G.
W78-01948

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, MI. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W78-01949

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, CLAIRTON WORKS, PITTSBURGH, PENNSYLVANIA, JANUARY 28-31, 1976.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-02020

DESIGN AND EVALUATION OF AN OILY WASTES DISPOSAL SYSTEM FOR RED RIVER ARMY DEPOT,
DARCOM Intern Training Center, Texarkana, TX.
For primary bibliographic entry see Field 5D.
W78-02024

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX),
Kappalaverket, Lidings (Sweden).
K. I. Dahlquist, L. Hall, and L. Bergman.
Techniques et Sciences Municipales-L'Eau, Vol. 72, No. 4, p 159-167, April, 1977. 6 fig, 2 tab, 8 ref.

Descriptors: *Titanium, *Sulfur compounds, *Iron compounds, *Nutrient removal, *Sludge treatment, Phosphates, Chemical precipitation, Waste water disposal, Waste water treatment, Ferrous sulfate.

Ferrous sulfate, a waste product of titanium oxide manufacturing and metal cleaning operations, presents disposal problems. It can, however, be used economically as a precipitation agent. Experiences in the United States, Finland, and Sweden are summarized regarding the use of ferrous sulfate to eliminate phosphates. A better sedimentation is achieved with ferric phosphate than with ferrous phosphate, probably because ferric ions are more strongly hydrolyzed. The Kappala purification plant in Sweden is described. Experiments to eliminate phosphates using ferrous sulfate are detailed, along with a discussion of sludge properties and digestion. The iron contained in the activated sludge does not seem to have a negative effect on BOD degradation. Compared to treatment with aluminum sulfate, this method produces a more easily handled sludge which does not require post-precipitation of phosphates. Optimum application methods are outlined for using ferrous sulfate. (Blits-FIRL) W78-02025

PHOSPHATE REMOVAL FROM AQUEOUS SOLUTION FROM ACTIVATED RED MUD, Tokyo Univ. (Japan). Dept. of Metallurgy and Materials Science.
For primary bibliographic entry see Field 5D.
W78-02036

PERMISSIBLE CONCENTRATIONS OF ALCOHOLS AND FURFURAL IN WASTE WATER USED FOR IRRIGATION (O DOPUSTIMOM SODERZHANI SPIRTOV I FURFUOLA V STOCHNYKH VODAKH, ISPOL'ZUEMYKH DLYA OROSHENIYA), V. T. Dodkina, B. F. Zhirmov, and L. E. Kutepov. *Gidrotekhnika i Melioratsiya*, No. 4, p 101-104, 1977. 5 tab.

Descriptors: *Soil-water-plant relationships, *Absorption, *Chemical wastes, *Environmental effects, *Return flow, Alcohols, Irrigation practices, Organic compounds, Analytical techniques, Waste water disposal, Furfural.

The persistence of methanol, butanol, and furfural in soil and plants and their physiological effects on plants were studied to establish the maximum permissible concentration of these compounds in waste water used for flooding or spray irrigation. Methanol, added to water in concentrations of 100-400 mg/liter, completely disappeared from the upper 20-cm soil layer in 9 days. Butanol, added in 50-500 mg/liter concentrations to water, was decomposed in the soil in 3-5 days. The specific water consumption was 2,000-4,000 liters/ha for methanol-containing water, and 500-1,000 liters/ha for butanol-containing water. After irrigation, both compounds were degraded in a few days in the aerial parts of plants, and in 6-7 days in roots. In most cases, butanol stimulated the growth of cereal plants. Water containing 50-500 mg of furfural per liter was used for irrigation at rates of 800-2,400 liters/ha. Very rapid degradation was observed in the soil; traces were found on the fifth day in the 20-40-cm soil layer only after application of water with 300 mg/liter furfural or higher. Furfural was detectable in plants for 25-28 hrs only. When applied in a concentration of 500 mg/liter, furfural reduced the green mass of plants. The findings indicate that the maximum permissible methanol, butanol, and furfural concentration in wastewater intended for irrigation of farmlands should be set at 300 mg/liter. (Takacs-FIRL)
W78-02037

INDUSTRIAL DUMPS THREATEN GROUND-WATER.
For primary bibliographic entry see Field 5B.
W78-02043

DISPOSAL OF SWEET CHERRY PROCESSING BRINES, Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-02044

AT SUNKIST, LEMONS AND ORANGES DON'T MIX.
For primary bibliographic entry see Field 5D.
W78-02049

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIPARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA), For primary bibliographic entry see Field 5B.
W78-02056

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED, For primary bibliographic entry see Field 5D.

W78-02058

MUNICIPAL SEWERS HELP SOLVE WASTE DISPOSAL PROBLEMS, Armco Steel Corp., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-02062

HEMICELLULOSE-B FROM COMMERCIAL PINEAPPLE JUICE UNDERFLOW, Hawaii Univ., Honolulu. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5D.
W78-02069

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES. Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

RECLAMATION AND TREATMENT OF CLAM WASH WATER, Cornell Univ., Ithaca, NY. Dept. of Food Science. R. R. Zall, L. F. Hood, W. J. Jewell, R. L. Conway, and M. S. Switzenbaum.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 42-66, 1 fig, 20 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Canneries, *Commercial shellfish, *Pilot plants, *Water utilization, *Biological treatment, Recycling, Proteins, Water conservation, Food processing industry, Waste water disposal, Industrial wastes, Water utilization, Clam processing wastes.

Laboratory and pilot plant investigations and on-site studies at a Long Island clam processing plant were used in a study to characterize clam wash waters, develop methods to reduce water consumption and BOD landing in clam processing, examine methods of waste water treatment, and evaluate reclamation of proteins and flavor materials from clam wash water. Parameters monitored in waste water at the plant's clam washing stations included flow rate, water consumption, BOD, COD, protein, total solids, calcium, phosphorus, and chloride. Bacteriological data obtained for clams and wash water included yeast, mold, coliform, and total plate counts. In studies on the conversion of wash water to a canned juice product, ultrafiltration, open boiling, and vacuum filtration were used to concentrate wash water to a total solids concentration similar to that of market clam juice. Waste treatment studies on coagulation to reduce turbidity with trivalent solids, alum and ferric chloride, and chitosan as coagulants indicated that clam wash water was not particularly amenable to coagulation. Biological treatment of clam processing waste was investigated with four laboratory-scale aerobic lagoons operated at retention times of 2.5, 5, 10 and 15 days. The studies indicated that 90% COD reductions were possible with a hydraulic retention time of 2.5 days and total nitrification was possible after 5 days. (See also W78-02070) (Schulz-FIRL)
W78-02072

PILOT PLANT PRODUCTION OF A FUNCTIONAL PROTEIN FROM FISH WASTE BY ENZYMIC DIGESTION, Washington Univ., Seattle. Inst. for Food Science and Technology.
For primary bibliographic entry see Field 5D.
W78-02073

AN IMMOBILIZED-ENZYME PILOT PLANT FOR THE TREATMENT OF ACID WHEY, Lehigh Univ., Bethlehem, PA. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 5D.
W78-02074

IN-PLANT CONTROL TECHNOLOGY FOR THE FRUITS AND VEGETABLES PROCESSING INDUSTRY, SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-02075

LAND DISPOSAL OF WINERY WASTEWATER, Montgomery (James M.), Walnut Creek, CA.
For primary bibliographic entry see Field 5D.
W78-02076

LOW WASTEWATER POTATO STARCH/PROTEIN PRODUCTION PROCESS - CONCEPT, STATUS, AND OUTLOOK, Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-02077

TREATMENT OF MEATPACKING PLANT WASTEWATER BY LAND APPLICATION, Texas Univ. at El Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-02090

ZINC SLUDGE RECYCLING AFTER KASTONE TREATMENT OF CYANIDE-BEARING RINSE WATER, Metal Plating Corp., Connersville, IN.
For primary bibliographic entry see Field 5D.
W78-02091

FRUIT CANNERY WASTE ACTIVATED SLUDGE AS A CATTLE FEED INGREDIENT, Bovay Engineers, Inc., Spokane, WA. L. A. Esvelt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 357. Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-253, September 1976. 16 fig, 23 tab, 12 ref, 1 append.

Descriptors: *Feeds, *Livestock, *Canneries, *Food processing, *Centrifugation, Sludge disposal, Bioassay, Activated sludge, Recycling, Food chain, Cattle, Sludge treatment, Industrial wastes, Waste water treatment, Ultimate disposal, Fruit processing wastes.

A sludge disposal project conducted by Snokist Growers in Yakima, Washington, demonstrated the use of dewatered sludge from fruit processing wastes as a supplementary cattle feed, determined the actual food value of the biological solids in the sludge, and evaluated the effects on cattle of a diet containing fruit processing sludge. Pilot-scale and prototype-scale basket centrifuges were used to dewater the biological sludge to a dry solids content of 7.5-9%. Feed mixtures which contained 2.3% or 4.5% fruit processing sludge were reported as being comparable to the control feed in terms of the animal's ability to digest and metabolize the feed, while feed containing 9.2% sludge solids was reported as having a lower quality. Studies in which four lots of six uniform yearling steers were fed diets containing 0.0, 2.3, 4.6, and 8.9% sludge solids on a dry matter basis indicated that the incorporation of a relatively small amount of sludge into the feed did not have adverse effects. Feeds containing 2.3% sludge actually improved weight gain and carcass quality. Dewatering of fruit processing sludge for use in cattle feed is suggested as economically feasible where the biological solids can be sold at a calculated value of \$0.9-0.15 per kg dry solids. (Schulz-FIRL)
W78-02093

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5F—Water Treatment and Quality Alteration

5F. Water Treatment and Quality Alteration

AIR AND LIGHT IMPERVIOUS WATER PURIFICATION AND PRODUCT DISPENSING SYSTEM.

C. W. Gossett, and W. J. Dauenhauer.
U.S. Patent No. 4,014,792, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1796-1797, March 29, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Reverse osmosis, Separation techniques, Water quality control, Equipment.

The object of the invention is to provide a water purification and distribution system where a reverse osmosis module product is protected from contamination by reducing its exposure to air and light. The system comprises, in combination with a conventional water service valve-controlled line, a reverse osmosis module connected for recurrently receiving a supply of raw water and purifying it to emanate a nearly pure product water from its outlet. It contains an electrical circuit, a solenoid for opening and closing the line, a switch for opening and closing the circuit, together with a water storage sealed collapsible gab. (Sinha-OEIS) W78-01701

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.

Municipal Engineer, Vol 7, No 6, p 21-31, November 1976, 4 fig.

Descriptors: Water resources, Management, *Pumping stations, Distribution systems, *Water treatment, Pipelines, Rand Water Board, Barrage, Vaal Dam, Zuikerbosch Purification Plant, *South Africa.

The Rand Water Board's job to supply water is not an easy one. To give an indication of the extent: the area to be supplied covers about 17 075 km² with approximately 4 300 000 inhabitants, while 60% of the Republic's manufacturing production takes place in this area. In addition the water has to be lifted 305 m from the Vaal River to the reservoirs in Johannesburg. There is an increasing demand for potable water and the Board constantly has to plan and construct new pipelines, reservoirs, pumping stations, etc., to meet the growing demand. For instance, presently a R45 million project for the construction of a new pipeline from Zuikerbosch via Mapleton and Rynfield to Vlakkfontein is being carried out. And this is only one of the many projects under construction. (So. African Water Info Center) W78-01833

REMOVAL OF CADMIUM ION FROM AQUEOUS SOLUTION.

Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.
For primary bibliographic entry see Field 5D. W78-01913

APPARATUS FOR DESALTING SALINE WATER.

Societa Italiana Resine S.p.A., Milan (Italy). (Assignee).
For primary bibliographic entry see Field 3A. W78-02128

ELECTRICALLY REGENERATED ION EXCHANGE SYSTEM.

Sybron Corp., Rochester, N.J. (Assignee).
T. A. Davis.
U.S. Patent No 4,032,452, 9 p, 3 fig, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1709, June 28, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Demineralization, *Desalination, Separation techniques, *Ion exchange, Water softening, Anodes, Cathodes, Regeneration.

A more efficient electrically regenerated ion exchange system is accomplished by using elongated ion exchange members having a continuous ion exchange phase that is more conductive in the exhausted form than in the regenerated form. The continuous ion exchange phase reduces electrical power requirements by providing a low resistance path for the transport of ions from a demineralization compartment to electrode or waste compartments. Since the ion exchange materials are more conductive in the exhausted form, the electrical current tends to bypass the regenerated portions of the ion exchange bed, which means that the current is used more efficiently. A first demineralization compartment is provided adjacent to the anode compartment and a second demineralization compartment is provided adjacent to the cathode compartment. These demineralization compartments are separated by a waste compartment or by alternating waste and additional demineralization compartments. (Sinha-OEIS) W78-02138

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS.

Universal Oil Products Co., Des Plaines, IL. (Assignee).
G. E. Foreman, and P. K. Worsley.
U.S. Patent No. 4,033,878, 7 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 308-309, July 5, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Waste water treatment, Membranes, Membrane processes, *Osmosis, *Separation techniques, Direct osmosis.

A membrane module is made from at least one pair of spaced membrane sheets that are interposed between spaced porous material sheets and all of the layers of sheets are in turn spirally wound around an axially positioned hollow mandrel that has at least one internal flow blocking means and side-wall openings connected to an internal portion of one of the porous sheets so that a first fluid flow can pass outward from a portion of the mandrel into a portion of the connecting porous layer and into the envelope resulting from the encompassing membranes and then back into another portion of the mandrel so that at least one out-to-in flow will be made through the membrane envelope, while a second fluid stream is passed through the next adjacent porous material layers to carry the fluid which has permeated through the membranes. One or more modules can be maintained in a pressure tight, elongated housing to provide an operation where one fluid is passed through the mandrel portions and through the layers of a first porous material and the membrane envelopes while a second fluid can pass longitudinally through the container and through the spaced layers of the other porous material result in a operation whereby one fluid stream will be concentrated and the other fluid diluted from osmotic fluid flow passing through the membrane layers. (Sinha-OEIS) W78-02154

WATER PURIFICATION SYSTEM.

P. J. McLean.
U.S. Patent No. 4,035,240, 4 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 960, no 2, p 766, July 12, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Domestic water, Distillation, Condensation, Equipment.

The water purification apparatus of this invention is used in combination with a domestic hot water

heating tank and comprises a water container through a passage controlled by a float-actuated needle valve. Water in the container receives additional heat from a heat-radiating pipe which extends from the tank through the container and back to the tank to maintain a continuous circulation. Water vapor formed in the container is carried away through a duct and condenses. A receptacle is provided for receiving condensate from the discharge outlet of the duct. (Sinha-OEIS) W78-02159

METHOD AND APPARATUS FOR PURIFYING A LIQUID BY PRESSURE DISTILLATION.

V. E. Carman.
U.S. Patent No. 4,035,241, 7 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 766, July 12, 1977.

Descriptors: *Patents, *Water treatment, *Desalination, *Demineralization, *Vapor compression distillation, Condensation, Separation techniques, Sea water, Waves(Water), Ocean waves, Equipment.

An apparatus and method for purifying a liquid by pressure-induced vaporization and condensation is described. The method comprises subjecting a liquid contained within a first enclosure to a negative pressure sufficient to convert a portion of the liquid to a vapor, transferring the vapor to a second enclosure, and then subjecting the vapor within the second enclosure to a positive pressure sufficient to condense the vapor back into a liquid. In this manner, any nonvolatile material contained within the impure liquid will remain in the first enclosure and only the volatile or pure components of the liquid will be transferred to the second enclosure. Where the liquid purifying process is to be carried out near an open body of wave-activated water, for example to desalinate sea water, the undulating motion of the body of water is used to provide the necessary pressure variation within the two enclosures. When such naturally occurring wave action is either inadequate or absent, the necessary pressure variations are produced by mechanical means. (Sinha-OEIS) W78-02160

5G. Water Quality Control

OIL BOOM FOR COLLECTING AND SKIMMING OIL ON A WATER SURFACE.

National Marine Service, Inc., St. Louis, MO. (Assignee).
C. In't Veld.
U.S. Patent No. 4,014,795, 8 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1797, March 29, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Skimming, *Water pollution treatment, Water quality control, Water pollution control, Equipment, Flow control.

An oil boom for sweeping and collecting oil from the surface of a body of water is constructed of a framework of structural members arranged in the form of a box beam. The framework supports two parallel rows of floating barrier screen panels and is connected to end floats. Flow diverter vanes beneath the barrier screen panels caused a surface transport current to flow between the two rows of the panels towards a surface skimmer located adjacent one end of the boom when the boom is towed in a direction transversely of its length across the body of water. The forwardmost row of the barrier screen panels sweeps floating oil on the water surface towards the skimmer, and the transport current carries oil that is caught in the underflow beneath the forwardmost row of panels towards the skimmer. Extension arms including floating vertical barrier screen panels are pivotally attached to the boom to extend the sweep area. The arms can be folded inward against the central

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boom structure for stowage of the boom. (Sinha-OEIS)
W78-01702

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.

Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry. Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 381, Price codes: A17 in paper copy, A01 in microfiche. EPA-600/7-77-004, January, 1977.

Descriptors: *Research and development, *Grants, *Planning, *Projects, Administrative agencies, Allotments, Analytical techniques, Economics, Laboratories, Model studies, Research equipment, Research facilities, Technology, Testing, Research priorities, Federal government, Institutions, Management, Instrumentation, Environmental Protection Agency.

The Environmental Protection Agency (EPA) program report contains project-level descriptions of many research and development projects funded by the EPA-Coordinated Interagency Energy/Environment Research and Development Programs for 1976. The projects are classified into one of five research, development, and demonstration categories which include: pollutant characterization, measurement, and monitoring; environmental transport processes; health effects; ecological effects; and integrated assessment. Within each category, the programs are grouped by agency. Project descriptions are culled from research notice forms prepared by the appropriate laboratories and agencies using the Smithsonian Science Information Exchange format. Tables included in the report delineate total funding by each research and development category and agency. Other tables show the funding by each of the five research categories, by the energy source for each agency, and by each energy cycle component, i.e. extraction, processing, transportation and conversion, and utilization. (Moorhouse-Florida)
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.

Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry. Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 791, Price codes: A14 in paper copy, A01 in microfiche. EPA-600/7-77-003, January, 1977.

Descriptors: *Laboratories, *Project purposes, *Project planning, *Research and development, *Grants, Administrative agencies, Benefits, Fuels, Nuclear energy, Thermal power, Cost allocation, Cost-benefit analysis, Economics, Engineers estimates, Comprehensive planning, Materials testing, Model studies, Planning, Projects, Research equipment, Research facilities, Technology, Coals, Gases.

Identifiers: *Environmental Protection Agency.

This report contains project-level descriptions of many research and development projects funded by the Environmental Protection Agency-Coordinated Interagency Energy/Environment research and development program for fiscal year 1976. Each project description is grouped in accordance with one of nine research, development, and demonstration categories which include: energy resource extraction; physical and chemical coal cleaning; flue gas cleaning; direct combustion; synthetic fuels; nuclear; thermal; improved efficiency; and, advanced systems. Within each of the above listed categories, project descriptions are grouped by agency. The project descriptions are culled from 'Notice of Research Project' forms prepared by the appropriate laboratories and agencies using the Smithsonian Science Information Exchange format. Various tables attached to the

report show budgetary breakdowns by agency, research and development category, and various stages in the energy cycle. (Moorhouse-Florida)
W78-01717

CONTROLLING INDUSTRIAL WATER POLLUTION—PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).

Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 329, Price codes: A05 in paper copy, A01 in microfiche. December 1970. 76 p.

Descriptors: *Federal Water Pollution Control Act, *Water Quality Act, *Industrial wastes, *Governmental interrelations, *Administrative agencies, Industrial plants, Effluents, Abatement, Pollution abatement, Water quality, Federal government, Water pollution, Legal aspects, State governments, Water quality standards, Water pollution control, Water pollution effects, Water pollution sources, Waste water (Pollution), Waste water treatment, Federal Water Quality Administration, Secondary treatment, Effluent limitations.

Prior to the establishment of the Environmental Protection Agency, the establishment and enforcement of water quality standards was a function of the Federal Water Quality Administration of the Department of the Interior in accordance with the provisions of the Federal Water Pollution Control Act of 1956 and the Water Quality Act of 1965. This 1970 report to Congress by the Comptroller General examined the abatement of industrial water pollution under the Federal Water Quality Administration. The primary responsibility for dealing with the problem rested with the individual states, and the effects and results of abatement programs varied widely from state to state. The report recommends that the Secretary of Interior encourage states to strengthen the staffs of the appropriate agencies; develop an inventory of sources of industrial pollution; and obtain data on progress being made by industry in meeting target dates for constructing abatement facilities. The report also recommends that Congress provide federal authority to establish and enforce specific effluent restrictions, expand federal jurisdiction to all navigable waters, bring enforcement action against industries failing to meet implementation schedules, and provide additional grant funds to states for administering water pollution control programs. (Sloan-Florida)
W78-01718

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES.

Public Administration Service, Chicago, IL. T. Jacobi.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 375, Price codes: A03 in paper copy, A01 in microfiche. October, 1964.

Descriptors: *Budgeting, *Personnel management, *Manpower, *Water pollution control, State jurisdiction, Employment, Management, Planning, Administrative decisions, Human resources, Personnel, Salaries, Wages, Cost allocation, Estimated costs, Financing, Water pollution, Water quality, Water quality control, Programs, Decision making, Project planning, *State policy.

The success of a state water pollution control program is affected by its staffing and its budgetary limitations. To determine personnel and financial needs, this 1964 study selected criteria that would measure need, be reflective of change, and were based on authoritative data. Total state population, population density, urbanization, recreational use, industrialization, and wet industries

were among the factors used. Recommended general and facility service staff requirements are presented, divided by state, population size, and aspect of the pollution control program. Total proposed staffing needs constituted a principal basis for determination of budgetary requirements. Survey findings indicated that 75% of the average state water pollution control budget consisted of personal service costs. Supplies, materials, and services were estimated at an additional 33% of the budgeted amount for personal services. Study results are outlined in table format. The report concludes that in addition to staff and budgetary support, factors such as the legal basis of the pollution program, training of personnel, planning and balance within the program, and compliance measures used are conditions for successful programs. Consideration of these factors is more difficult, however, since they are not numerically definable. (Mulligan-Florida)
W78-01720

LAWS AND REGULATIONS AFFECTING COAL WITH SUMMARIES OF FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS PERTAINING TO AIR AND WATER POLLUTION CONTROL, RECLAMATION, DILIGENCE AND HEALTH AND SAFETY.

Department of the Interior, Washington, DC. Office of Minerals Policy and Research Analysis. Available from the National Technical Information Service, Springfield, VA as PB-255 927, Price codes: A24 in paper copy, A01 in microfiche. Part 1 of 2-part study June 1976.

Descriptors: *Cost-benefit analysis, *Water pollution control, *Coal mines, *Reclamation, Federal reclamation law, Clean Air Act, Economics, Coals, Safety, Public health, Benefits, Costs, Industrial production, Cost-benefit ratio, Strip mines, Coal mines wastes, Permits, Legislation, Regulation, Administrative agencies, Mining, Water pollution, Air pollution, Governments, *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System, Effluent guideline, Effluent limitations, Sulfur dioxides, Explosives, Administrative regulations.

All of the federal, state and local laws and regulations affecting the production and use of coal are summarized as one part of a two-part study of the benefit-cost ratio of such laws and regulations. This handbook is designed for use as a reference manual for the average citizen without specialized knowledge. A glossary of technical terms is included. The laws and regulations are catalogued under five general headings: air pollution control, water pollution control, reclamation, diligent development, and health and safety. Each section describes the pertinent federal regulations and discusses applicable state laws when such state laws are supplementary to the federal law. Local laws are discussed only as they relate to air pollution. The major federal laws providing for nationwide regulatory authority are the 1970 Federal Clean Air Act Amendments, the 1972 Federal Water Pollution Control Act Amendments, and the 1969 Federal Coal Mine Health and Safety Act. (Sloan-Florida)
W78-01721

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT).

Energy Research and Development Administration, Washington, DC. May, 1977 (2 vols.).

Descriptors: *Environmental effects, *Thermal pollution, *Electric power plants, *Uranium radioisotopes, Environmental control, Water pollution, Chemical wastes, Evaporation, Fish management, Effluents, Heat pollution, Benefits, Economic impact, Social aspects, Rivers, Cooling

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

water, Intakes structures, Groundwater resources, Water supply, Intakes structures, Groundwater resources, Water supply, Ohio, Ohio River, *Environmental impact statement, *Environmental groundwater management, *Uranium enrichment, National Environmental Policy Act, Environmental policy, Non-point sources(Pollution), Point sources(Pollution), Gaseous diffusion, Gaseous diffusion plants.

The Portsmouth, Ohio Gaseous Diffusion Plant has been enriching uranium since 1954. The impact of its continued operation with increased capacity considered in combination with two power plants which supply its electricity is detrimental to the Ohio River and the Scioto River which joins the Ohio at Portsmouth. There is a heat increase in these rivers caused by the generating plants. Impingement of fish on cooling water intake screens and the discharge of chemicals into the rivers are considered adverse impacts. Infiltration through ash disposal ponds may contaminate the ground water supply, a water source for nearby communities. Plant modification, which would produce only minor improvement in environmental quality, is too costly to justify, although improved water treatment could benefit the discharge from ash pits. If the Portsmouth plant continues to operate, the use of the rivers for disposal of heat and wastes is an irreversible commitment of resources. The study's Environmental Trade-Off Analysis concludes that the socio-economic benefits of enriching uranium outweigh the socio-economic disadvantages and the continuing loss of ecological habitat. (Jones-Florida) W78-01722

POLLUTION OF NAVIGABLE WATERS OF THE DETROIT RIVER, LAKE ERIE AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN.

Public Health Service, Rockville, MD. Available from the National Technical Information Service, Springfield, VA as PB-253 697, Price codes: A10 in paper copy, A01 in microfiche. Proceedings of the Joint Federal-State of Michigan Conference, March 27, 1962, Detroit, Michigan. 177 p.

Descriptors: *Great Lakes, *Federal Water Pollution Control Act, *Michigan, *Water Pollution Control Act, *Michigan, *Water pollution, *Conferences, Lake Erie, Coliforms, Municipal wastes, Recreation, Navigable waters, Bodies of water, Tributaries, Bacteria, Water pollution sources, Water quality, Sewage, Waste disposal, Water pollution control, Industrial wastes, Sewage abatement, Sewage disposal, Waste water, Pollution abatement, Rivers.

A federal-state conference on water pollution was convened in Michigan at the request of the governor in accordance with the provisions of Section 8 of the Federal Water Pollution Control Act. The conferees, representing various agencies of federal, state, and local governments, agreed that the Michigan waters of Lake St. Clair, the Detroit River, Lake Erie and their tributaries were undergoing pollution subject to abatement under the Act, and that the discharges causing the pollution came from various industrial and municipal sources. In the course of a two-day conference, reports were presented on such causes of pollution as sewage treatment plants, commercial shipping, power plants, automobile factory wastes, dredging operations, and other industrial waste discharges. Water pollution was found to interfere with legitimate water uses including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating and other forms of recreation. The conferees recommended that a cooperative investigation be undertaken by the Department of Health, Education, and Welfare in cooperation with the proper Michigan state agencies to determine effects and appropriate methods of abatement of pollution. (Sloan-Florida) W78-01725

PROCEEDINGS OF JOINT MEETING OF FEDERAL AND STATE GOVERNMENTS ON MISSISSIPPI RIVER TEMPERATURE STANDARDS (2ND SESSION) HELD AT ST. LOUIS, MISSOURI ON MARCH 3, 1971.

Environmental Protection Agency, Office of Water Quality, Washington, D.C. Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 867, Price codes: A13 in paper copy, A01 in microfiche. March 1971. 296 p.

Descriptors: *Mississippi River, *Standards, *Thermal pollution, *Fish conservation, *Water temperature, Fish types, Fish physiology, Fish reproduction, Biology, Water pollution, Water pollution control, Water pollution sources, Temperature control, Cooling towers, Low flow, Cooling, Electric powerplants, Powerplants, Missouri River, Rivers, Federal government, State governments, Aquatic life, *Environmental Protection Agency.

The discharge of heated effluent into the Mississippi River by nuclear and fossil fuel plants can raise river temperatures above natural levels thereby harming biota. Therefore, water temperature standards have been proposed for the river. The Mississippi River is divided into five zones, each demanding different standards. Included are data and charts showing: (1) natural water temperatures recorded monthly in each zone; and (2) temperatures conducive to the survival, growth, and reproduction of species of fish populating the Mississippi River. Maximum safe water temperatures for each month and zone are listed. The report recommends that the maximum artificial rise in water temperature in any given zone and month not exceed either five degrees Fahrenheit above the recorded natural temperatures or the maximum safe temperature, whichever is lower. Changes in temperature caused by natural conditions and normal daily and seasonal temperature fluctuations should be maintained. Low flow data is provided and locations and generating capacities of power plants abutting the river are given. Plants can easily comply with the standards with closed cycle cooling being the most economically feasible means. These proceedings include numerous reports and general discussions. (Smith-Florida) W78-01726

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,

R. G. Berger. Land and Water Law Review, Vol. 12, No. 2, p. 431-56, 1977.

Descriptors: *Pollution abatement, *Return flow, *Waste water disposal, *Economic justification, *Prior appropriation, Beneficial use, Appropriation, Colorado, Discharge(Water), Effluents, Water pollution, Evaporation, Municipal water, Waste water(Pollution), Legal aspects, Wyoming, Water policy, Water transfer, Water storage, Water reuse, Preference(Water rights), *Total containment systems.

In the western states, aridity makes the efficient use of water especially important. Therefore, questions of legality and policy arise with respect to the use of total containment water quality control systems, a pollution control method by which water polluted by riparian users is contained and evaporated after use rather than treated and discharged back to the stream. To be legally viable, such consumption must be a 'beneficial use' of water, a doctrine the author defines, discusses, and criticizes with the aid of relevant statutes and cases. Legal viability also depends upon the system's ability to withstand challenges from junior water appropriators whose vested water rights protect them from a change of use - reuse dichotomy reveals that total containment systems involve neither. Such systems will probably be favored by the courts; however, decisions made

on semantic, legal grounds should be rejected in favor of reliance on social and economic policy which dictates that inequitable and inefficient allocation of resources will result if the implementation of total containment systems is permitted as a matter of right. (Smith-Florida) W78-01728

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,

Wyoming Univ., Laramie. Coll. of Law. For primary bibliographic entry see Field 6E. W78-01729

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT),

Spessard L. Holland Law Center, Gainesville, FL. For primary bibliographic entry see Field 6E. W78-01730

A RECALL FOR GREENWAYS,

For primary bibliographic entry see Field 6E. W78-01732

LEGAL ASPECTS OF THERMAL DISCHARGES,

New York Power Authority, NY. For primary bibliographic entry see Field 6E. W78-01733

HOW SHOULD CONGRESS AMEND PL 92-500, Los Angeles County Sanitation Districts, CA. For primary bibliographic entry see Field 6E. W78-01736

INTERNATIONAL ENVIRONMENTAL LAW, INTERNATIONAL CONVENTIONS CONCERNING OIL POLLUTION AT SEA,

Inter-Governmental Maritime Consultative Organization, London (England). Legal Div. For primary bibliographic entry see Field 6E. W78-01745

IMCO: AN ENVIRONMENTALIST'S PERSPECTIVE,

Center for Law and Social Policy, Washington, DC. For primary bibliographic entry see Field 6E. W78-01746

LAW OF THE SEA (NEW YORK SESSION OF THE THIRD U.N. LAW OF THE SEA CONFERENCE).

For primary bibliographic entry see Field 6E. W78-01749

PROTECTION OF LAKE TAHOE AND ITS WATERSHED.

For primary bibliographic entry see Field 6E. W78-01753

STATE OF ALABAMA EX REL. BAXLEY V. ENVIRONMENTAL PROTECTION AGENCY (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).

For primary bibliographic entry see Field 6E. W78-01758

SHELL OIL COMPANY V. TRAIN (ADMINISTRATIVE RULINGS ON EFFLUENT LIMITATIONS CHALLENGEABLE ONLY IN FEDERAL CIRCUIT COURTS).

For primary bibliographic entry see Field 6E.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

W78-01763

RESOURCE MANAGEMENT AND ESTUARINE FUNCTION WITH APPLICATION TO THE APALACHICOLA DRAINAGE SYSTEM, Florida State Univ., Tallahassee.

R. J. Livingston.
Available from National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 3-17, 9 fig, 2 tab, 25 ref.

Descriptors: *Estuaries, *Baseline studies, *Florida, Water pollution effects, Resources development, Drainage systems, *Apalachicola drainage system (Fla).

Problems encountered in the management of an estuarine system in north Florida are discussed with respect to existing programs and laws in Florida. The often difficult decisions concerning resource development depend on the availability of baseline scientific and socio-economic data. Information is needed concerning the basic energy relationships of estuaries and the long-term effects of pollution on such systems. Realistic estuarine management practices involve an interdisciplinary approach at both the local and regional levels. Federal programs should be aimed at the translation of scientific information into the planned development of the entire drainage area of a given estuary. Based on unsuccessful attempts of resource management in the Apalachicola drainage system, a generalized plan for estuarine development is given. (Sinha-OEIS)
W78-01764

THE RHODE RIVER PROGRAM,

Smithsonian Institution, Edgewater, MD.
D. L. Correll.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 19-27, 4 tab, 5 ref.

Descriptors: *Chesapeake Bay, *Nutrients, *Estuaries, *Baseline studies, *Environmental effects, Land use, Water pollution, Maryland, Rhode River (Md).

An intensive study of the interactions of the Rhode River, a subestuary of Chesapeake Bay, with its watershed and airshed is being conducted at the Chesapeake Bay Center for Environmental Studies. Rainfall is a major source of nitrogen nutrients for the watershed and estuary. Very little of the nitrogen in the rain falling on the watershed or that applied to cultivated croplands reaches the estuary. Almost all of the phosphorus loading of the estuary is from watershed runoff. Using land use analysis and watershed runoff studies, seasonal area yield loading rates have been calculated from land use categories. Freshwater wet areas are effective traps for nitrogen, phosphorus and mineral suspended matter, while residential areas and cultivated croplands are major non-point sources of these parameters. Neither the upland soils, nor the tidal marsh sediments can be considered long term sinks for phosphorus. Most of the organic matter which fuels the food chains of the estuary is produced by the phytoplankton, rather than upland forests, tidal marshes, or mud flat benthic plants. The phytoplankton productivity peaks in an area of the estuary in which the ratio of nitrogen to phosphorus is between 5 and 20. Net productivity also peaks in this zone. Thus this

estuary, which has no point sources of pollution, is maintained in a eutrophic situation by nitrogen loading from rainfall and distant sources of water pollution in the bay, and from phosphorus loading from residential and agricultural diffuse sources. Where the ratio of these nutrients is maintained within a biologically useful range intensive phytoplankton blooms develop. (Sinha-OEIS)
W78-01765

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT,

South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.

W78-01766

PROBLEMS, ADVANCEMENTS, AND FACTORS CONTROLLING ESTUARINE WILDLIFE MANAGEMENT PROGRAMS,

Texas A and M Univ., Jasper.
For primary bibliographic entry see Field 2L.

W78-01767

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,

Cornell Univ., Ithaca, NY.
R. J. Kalter.

Available from the National Technical Information Service, Springfield, VA, 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 83-94, 2 fig, 4 tab, 14 ref.

Descriptors: *Estuaries, *Recreation, Resources development, Environmental effects, Water quality control.

Determinants of recreation activity are discussed and justification for the provision of recreation services by the public sector outlined. After reviewing the availability of data and other studies pertaining to recreational use, projections of recreation demand are made for selected activities. Economic models based upon a 1972 national recreation survey serve as the basis for this effort. The implication of these forecasts for the nation's estuarine areas is evaluated and policy recommendations, based on this analysis, are provided. (Sinha-OEIS)
W78-01770

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,

Development and Resources Corp., Sacramento, CA.
For primary bibliographic entry see Field 6G.

W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,

East Carolina Univ., Greenville, NC.
S. R. Riggs.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 121-136, 3 tab, 27 ref.

Descriptors: *Estuaries, *Resource development, *United States, *Economics, *Mineral deposits, Pollutants, Water pollution effects, *Extractive industries, Coastal zone.

A basic knowledge of the mineral reserves and the general economic value to man is essential prior to the development of any land and water use management plans involving the continued development of our coastal zone. Economics of a given mineral resource may change dramatically in response to new technological advances, discoveries of new ore deposits, or as industrial and social demands change with time. Such changes can have drastic effects upon the same management programs which define land and water uses. The resulting dilemma becomes of paramount importance: the need to protect a delicately balanced estuarine system, upon which man is dependent, and at the same time dramatically increase its use and modification for materials which man is also dependent upon. (Sinha-OEIS)
W78-01772

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,

State Univ. of New York at Stony Brook.
J. L. McHugh.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 149-168, 1 fig, 5 tab, 31 ref.

Descriptors: *Estuaries, *Water pollution effects, *Pollution abatement, *Water quality control, *Estuarine fisheries, Resources development, Shellfish, DDT, New York, *New York Bight, Commercial fisheries, Middle Atlantic Ocean, Landings.

Landings of fish and shellfish by domestic commercial fisherman in the Middle Atlantic Estuarine Area (Rhode Island-Virginia inclusive) nearly doubled in weight from 1969 to 1973, from about 586 million to more than 1,074 million pounds. The increase was not accompanied by a similar increase in fishing effort, but by distinct increases in abundance of certain coastal fishes like menhaden, weakfish, summer flounder, and bluefish. In the area north of Chesapeake Bay blue crab was more abundant than it has been for more than a decade and scup also was more plentiful. It is tempting to attribute these increases to pollution abatement, but no direct proof is available. For example, the return of blue crab to the New York Bight area may have been made possible by the decline in use of DDT. All these species are known to vary widely in abundance from natural variations in environmental factors and it is difficult to separate natural from manmade causes. The only certainly adverse effects of water pollution abundance or catches of living marine resources are those which produce obvious and measurable effects, usually catastrophic, or which result in closure of shellfish beds. Because so many important living resources use the estuaries as spawning, nursery, or feeding grounds it is prudent to avoid additional deterioration of water quality and, where possible, to reduce dumping of wastes. (Sinha-OEIS)
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,

Living Marine Resources, Inc., San Diego, CA.
For primary bibliographic entry see Field 2L.

W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,

Texas A and M Univ., College Station.
S. H. Hopkins, and S. R. Petrocelli.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained

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in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 177-190, 73 ref.

Descriptors: *Water pollution effects, *Estuarine fisheries, *Gulf of Mexico, *Environmental effects, Resources development, Baseline studies, Commercial fisheries.

The gulf coast, with 13% of the U.S. coastline producing one-third of the Nation's fisheries catch, is enriched by the Mississippi and many smaller rivers. The same river water that brings in food and fertility also brings pollutants from cities, industries and agricultural areas. So far, this pollution has not provably affected the commercial fisheries, except that closure of some bay areas by health authorities has hurt the oyster fishery. But over 95% of gulf fisheries production is based on species that depend on estuarine nursery areas and are therefore vulnerable to pollution and other man-made changes in estuaries. Fish kills and decreased reproduction in some areas warn of what could happen if conditions get worse. Research is needed on the costs as well as the benefits of man's activities, including pollution and pollution control, as population increases. (Sinha-OEIS) W78-01776

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY

Texas Univ. at Dallas, Richardson.
G. F. Lee.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 211-216, 3 ref.

Descriptors: *Estuaries, *Sediments, *Dredging, *Water quality, Water pollution effects, Chemical wastes, Pollutants.

A review of the information available today on the relationship between the presence of chemical contaminants in dredged sediments and water quality shows no technical justification for the general adoption of alternate methods of disposal at this time. Further, it is shown that some of the alternate methods of disposal may be more ecologically damaging than those previously used. The U.S. Army Corps of Engineers initiated in 1973 the 5-year, \$30 million Dredged Material Research Program, designed to provide a technical base of information for the determination of the most ecologically sound, technically, and economically feasible methods of disposal. This program shows great promise in providing needed information. (Sinha-OEIS) W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE

Miami Univ., FL.
J. H. Carpenter.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 217-216, 3 ref.

Descriptors: *Estuaries, *Dredging, *Environmental effects, *Sediments, *Erosion, Pollutants, Resources development, Water pollution.

The current level of dredging activity for navigation channels (250,000,000 cubic yards annually) is producing substantial effects in the United States estuaries. These effects derive from (1) physical changes at the dredge site and release of substances from the sediment during the dredging; and (2) physical changes at the disposal area—filling of deeper areas and smothering of bottom dwelling organisms—and release of substances to the waters of the disposal area. The recent increased use of diked disposal areas, along the shorelines at increased costs, does not eliminate all of the environmental effects. Since soil erosion throughout the watershed is the primary source of the sediments, the obvious management strategy is control at the source. In addition to the recognized desirability of soil conservation, erosion control should be identified as essential to prevent continuing damages to estuaries. (Sinha-OEIS) W78-01779

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING

Espey, Huston and Associates, Inc., Austin, TX.
W. H. Espey, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 225-234, 4 fig, 4 tab, 32 ref.

Descriptors: *Estuaries, *Dredging, *Gulf of Mexico, *Environmental effects, Water quality, Water pollution effects.

The coastal zone is a rich national asset closely tied to our economy. Man's activity in the coastal zone has caused this rich national asset to be placed in jeopardy. 'The National Estuarine Study' (1970) estimated that approximately 85% of the estuaries located on the gulf coast have been modified because of man's activities. Shell dredging activities in the gulf coast region indicate a slight downward trend and are expected to decline as a whole in the future. The reasons for the reduction in shell dredging activity reflect both alternative raw materials and environmental concern. However, the overall USCE dredging activities as well as private dredging are expected to increase in the near future. Insufficient data are available on the extent of dredging and filling in the gulf coast, where it is a major environmental problem. Many of the environmental aspects of dredging are not well understood. The federal permit system that deals with dredging activities in the coastal zone needs to be centralized and streamlined to expedite the efficient processing of permits. Environmental criteria used in evaluating USCE dredging permit applications should be clarified and quantified to the extent possible. (Sinha-OEIS) W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES

American Univ., Washington, DC.
M. A. Champ.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 237-255, 9 fig, 5 tab, 45 ref.

Descriptors: *Estuaries, *Nutrients, *Ecosystems, Waste disposal, Water pollution effects, Resources development, Eutrophication.

An evaluation is made of the current status of nutrient loading in the nation's estuaries. Special consideration is given to sources and transport of nutrients and their impact on estuarine ecosystems. Critical problems and trends in nutrient loading are reviewed at the national level and for six major estuaries: Cook Inlet, Columbia River Estuary, San Francisco Bay, Galveston Bay, Pamlico Sound and Chesapeake Bay. (Sinha-OEIS) W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS

North Carolina State Univ. at Raleigh.
J. E. Hobbie, and B. J. Copeland.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 257-274, 41 ref.

Descriptors: *Estuaries, *Nutrients, *Ecosystems, *Water pollution effects, Ecology, Resources development, Environmental effects, Algae, Algal blooms.

Almost all nutrients entering estuaries come via streams, with smaller amounts from precipitation and the ocean. Oversupplies of nutrients are transported to estuaries from land-use activities, sewage disposal, industry, agricultural wastes, urban runoff and mining. Increased nutrients cause algal blooms, which lead to more subtle estuarine ecological problems. Many processes affect nutrient concentrations during transportation and after they reach the estuary. Absorption, dilution, coagulation, and sedimentation decrease nutrient concentrations in estuarine waters. Since an equilibrium is established between water and sediment, nutrients are also released to the water from sediment storages. Biological activities influence nutrient cycling and concentration. Several control mechanisms are discussed. The potentially most successful and least harmful means of controlling nutrient inputs to estuaries is to control them at their source. After nutrients reach estuaries, there is little possibility for effective reduction in nutrient concentrations. Suggestions for research to develop new and more effective means to control nutrient inputs to estuaries are made. These include denitrification, land-use practices, natural filters, treatment innovations, and new ways to assess ecosystem response. Finally, management mechanisms are suggested to influence nutrient inputs and to minimize effects. (Sinha-OEIS) W78-01782

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS

California Univ., Berkeley.

E. A. Pearson.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 275-284, 1 fig, 4 tab, 6 ref.

Descriptors: *Estuaries, *Waste disposal, *Waste water pollution, Outfall sewers, Water pollution, *Outer Continental Shelf, Ocean dumping.

The design of estuarine wastewater management systems should consider the cost and effective-

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ness of specific pollutant removal (treatment) and the cost and efficacy of wastewater transport to and dispersion in areas of high dilution capacity, and of minimal ecological significance. A representative example cost analyses for a city of one million persons indicates that the incremental cost of upgrading treatment from secondary to advanced (tertiary) level is adequate to build and operate a land interceptor-transport system about 124 kilometers in length. Similarly, for a coastal city (Pacific Coast conditions) the same incremental cost for upgrading treatment would build and operate (break-even basis) a deep water outfall-diffuser system about 28.6 kilometers in length. If long-term protection of estuarine resources is to be achieved, all technical and economically feasible steps should be taken to transport adequately treated wastewaters out of estuarine systems, to the open coast in well engineered transport and high-dilution capacity outfall dispersion systems. (Sinha-OEIS) W78-01783

POLLUTION PROBLEMS IN THE ESTUARIES OF ALASKA

Alaska Univ., College.
D. W. Hood, and J. J. Goering.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 285-296, 2 fig, 2 tab, 18 ref.

Descriptors: *Estuaries, *Alaska, *Oil pollution, Resources development, Environmental effects, Pollution abatement, *Outer Continental Shelf.

The Alaskan marine coastal systems are classified into 13 categories which represent nearly all systems found in the 48 contiguous states with the exception of tropical systems and those heavily stressed by petrochemical and other complex industrial pollutants. Alaska is the only state that has ice-stressed coastal systems. It also has 54% of the United States coastline and 53% of its tidal shoreline. The scope of Alaskan coastal pollution problems at present and in the future are examined. Minor problems associated with wastes from municipalities and activities of the petroleum, timber, pulp and paper, and the fishing industries are presently evident. Increased petroleum production and the associated transport of oil products through Alaskan coastal systems poses a future large scale pollution risk. An evaluation of previous Alaskan coastal pollution abatement programs and trends is given. Because Alaska has such unique coastal systems it is concluded that any future coastal pollution control program will succeed only if based on sound environmental data rather than on adaptations of standards uniformly administered throughout the 48 contiguous states. Emphasized through the paper is the need for better environmental understanding of Alaska's coastal systems upon which decisions can be wisely made that will protect them, and at the same time utilize them for waste disposal and extraction of the resources needed to benefit man. (Sinha-OEIS) W78-01784

ENVIRONMENTAL STATUS OF HAWAIIAN ESTUARIES

Hawaii Inst. of Marine Biology, Honolulu.
S. V. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 297-306, 6 fig, 6 tab, 26 ref.

Descriptors: *Estuaries, *Hawaii, *Water quality, *Environmental effects, Resources development, Baseline studies, *Outer Continental Shelf.

Hawaiian estuaries are small but numerous, and they are of importance to the State of Hawaii. With a few exceptions, detailed environmental information about these estuaries is lacking. Circulation in the estuaries is sluggish. Many of the estuaries fail to meet water quality standards set by state law; this failure represents the combined effects of unrealistic standards governing excessive discharges. The major human stresses imposed on the estuaries are the introduction of nutrients, freshwater, and sediments. More research directed at the estuaries as total systems is needed. (Sinha-OEIS) W78-01785

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY

Delaware Univ., Newark.
R. B. Biggs.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 309-318, 28 ref.

Descriptors: *Estuaries, *Industrial wastes, *Waste disposal, *Water pollution effects, Resources development, Hazards, Ecosystems, Industrialization.

When dealing with the effects of industrialization on the estuary, this paper addresses those problems unique to estuarine areas which have arisen through increasing industrial activities in the estuarine environment, and delineates individual industrial-estuarine pollution problems and discusses possible solutions. More specifically, the report examines pollution problems in estuaries, identifies factors that actually pollute, investigates the effect of control on the estuarine environment as a whole including human activities, and describes the procedures, if possible, for gaining control of such factors. The period from 1970 to the present is emphasized. (Sinha-OEIS) W78-01786

INDUSTRIAL WASTE POLLUTION AND GULF COAST ESTUARIES

Texas A and M Univ., College Station.
R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 319-329, 4 fig, 6 tab, 11 ref.

Descriptors: *Estuaries, *Texas, *Gulf of Mexico, *Industrial wastes, Water quality, Waste disposal, Industrialization, Houston ship channel.

The status of gulf coast estuaries is explored with regard to degradation of water quality from a variety of sources and mechanisms, emphasizing industrial waste effluents. The typical features of gulf coast estuaries, particularly the limited tidal action, the presence of bays behind barrier islands, and in many cases, limited flushing, are outlined. Environmental modification as differentiated from environmental pollution is presented and examples of the impact of each on Texas gulf coast estuaries is discussed. A hierarchy of water quality problems is presented and used to document the principal water quality problems in seven selected Texas estuaries. The causes of the degradation which lowers water

quality in these seven estuaries are listed with emphasis on waste-generating industries. The Houston ship channel is used as a case study to outline the potential solutions to each of the individual water quality problems. A plea is voiced for the consideration of novel or innovative solutions to water quality problems such as the concept of supplemental aeration which is proposed for the Houston ship channel. (Sinha-OEIS) W78-01787

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING

United Engineers and Constructors, Inc., Philadelphia, PA.
J. W. Blake.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 333-339, 4 fig, 2 tab, 1 ref.

Descriptors: *Estuaries, *Powerplants, *Thermal pollution, *Sites, Baseline studies, Data storage and retrieval, Environmental effects, Environmental impact, Power plant siting.

With present experience certain efficiencies can be brought to bear on evaluation of proposed power plant sites. These concern (1) ways and means of determining what data are really needed for thermal discharge impact evaluation, and (2) optimization of efforts to obtain such data. Data relevance cannot be determined through comparison with a list of parameters which must always be studied at every site, but rather through a list of topics to be considered for possible study, i.e., questions to be asked (the answers to which determine the parameters which need study at the specific site under consideration). Optimization of data acquisition could be greatly improved through addition of geographic indicators to all environmental data publications and indexing/storage systems, following the examples set by EPA STORET AND NODC listings for water quality parameters. Such complete data availability will make possible better predictions of significance of impact, and therefore more realistic and consistent decisions on utilization of our environment. (Sinha-OEIS) W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS

Maryland Univ., Solomons.
J. A. Mihursky.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 341-357, 40 ref.

Descriptors: *Estuaries, *Thermal pollution, *Environmental effects, Electric powerplants, Ecosystems, Water pollution effects.

Interactions between steam electric station operations and estuarine aquatic systems are described. Environmental problem areas are discussed under two broad categories: (1) the predator role of a power plant in terms of larger organisms impinging upon water intake structures, or of effects on smaller organisms upon passage through cooling water condenser systems; and (2) the discharge water or plume impact on resident and migratory organisms in the receiving water. Biological damaging effects are described from many factors other than excess heat alone, e.g., mechanical,

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biocides, et cetera. A number of siting and operating design options to achieve better compatibility are described. Integration of field and laboratory programs is urged at both national and regional levels. Present trends are reviewed. Four recommendations are made with regard to national and regional policies. Eleven recommendations are made with regard to research activities. (Sinha-OEIS)
W78-01789

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS, Pacific Gas and Electric Co., San Francisco, CA. R. H. Brooks, M. L. Brehmer, A. S. Autry, and F. N. Moseley. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 373-381, 1 fig, 15 ref.

Descriptors: *Estuaries, *Thermal pollution, *Environmental effects, *Powerplants, *Cooling water, Aquatic life, Baseline studies, Environmental impact.

Results of investigations into the effects of power plant cooling water discharges into selected, representative estuaries are presented. These studies performed at mid-Atlantic, mid-Pacific, and Gulf of Mexico locations indicate that, at these stations, the cooling water discharges have not adversely affected the surrounding, estuarine receiving water environment. The conclusion is reached that power plants can be operated on estuaries without adverse effects with the result that each potential or existing estuarine site should be evaluated on a 'case-by-case' basis. (Sinha-OEIS)
W78-01791

OIL POLLUTION IN THE COASTAL ENVIRONMENT, Woods Hole Oceanographic Institution, MA. For primary bibliographic entry see Field 5C.
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO, Mississippi State Univ., Mississippi State. For primary bibliographic entry see Field 5C.
W78-01793

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION, Environmental Impact Planning Corp., San Francisco, CA. For primary bibliographic entry see Field 5B.
W78-01794

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS, Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station. W. P. Davis, and D. P. Middaugh. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 415-423, 1 fig, 5 tab, 48 ref.

Descriptors: *Estuaries, *Chlorination, *Sewage effluents, *Cooling water, Ecosystems, Aquatic life, Antifouling materials, *Outer Continental Shelf, Disinfectants.

The use of chlorine as a disinfectant and antifouling agent is reviewed. Chemical reactions of chlorine in aquatic environments are discussed, with particular emphasis on the formation of halogenated organic constituents in freshwater and marine systems. Studies of the effect of chlorinated sewage effluents and cooling water from generating stations on marine organisms and ecosystems are summarized. (Sinha-OEIS)
W78-01795

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS, Mote Marine Lab., Sarasota, FL; and Eco-Analysts, Inc., Sarasota, FL. For primary bibliographic entry see Field 5C.
W78-01796

NATIONAL ESTUARINE MONITORING PROGRAM, Environmental Protection Agency, Gulf Breeze, FL. For primary bibliographic entry see Field 5A.
W78-01803

FACTORS BEARING ON POLLUTION CONTROL IN U.S. PORTS LOCATED IN ESTUARINE AREAS, Portland Harbor Pollution Abatement Committee, ME. E. Langlois.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 529-544, 8 fig, 17 ref.

Descriptors: *Estuarine environment, *Water pollution, *Harbors, *Resources development, *Water quality control, United States, Ecology, Education, Legal aspects, *Outer Continental Shelf, *Ports, Ballast water, Oily wastes, Coastal zone management, Deepwater ports.

Ports must meet environmental demands during a period when they are faced with abrupt changes in terminal design and operations. Attention must be given to increased costs, due to delays and confusions that will affect the economic productivity of our ports. Additional and equal attention must be placed on the effect port development will have on the existing and future ecology of our estuarine areas. (Sinha-OEIS)
W78-01805

FACTORS BEARING ON POLLUTION CONTROL IN WEST COAST ESTUARINE PORTS, San Francisco Dredging Committee, CA. F. Boeger. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 545-551, 15 ref, append.

Descriptors: *Water pollution control, *Estuarine environment, *Economics, Harbors, Regulation, U.S. West Coast, Ports.

The value of west coast estuarine ports is established; port operational problems attributable to pollution control are defined and analyzed. Major problem areas, including regulations and procedures, are explained with examples. It is concluded that water pollution control regulations cause the most problems and that they are charac-

terized by unjustifiable delay, risk, uncertainty, and confusion. Remedial recommendations are given. (Sinha-OEIS)
W78-01806

SEA GRANT ESTUARINE STUDIES, Texas A and M Univ., College Station. For primary bibliographic entry see Field 2L.
W78-01807

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION, University of West Florida, Pensacola. For primary bibliographic entry see Field 2L.
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARINE PROTECTION, Public Relations Consultant, Corpus Christi, TX. V. Smylie.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 581-591, 4 illust, 8 ref.

Descriptors: *Estuarine environment, *Texas, *Water quality control, Public lands, Water pollution, Pollution abatement, *Public interest, Public participation, Superports, Deepwater ports.

The projected superport inside the South Texas bay system at Harbor Island, near Corpus Christi, stirred public indignation to a high level. Here is the way the people of South Texas reacted—and the methods they used to make their voices heard. (Sinha-OEIS)
W78-01809

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA, Horan, Lloyd, Dennis, and Farr, Carmel, CA. For primary bibliographic entry see Field 2L.
W78-01810

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE, Washington Univ., Seattle. M. J. Hershman.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 607-616, 51 footnotes.

Descriptors: *Estuarine environment, *Land use, *Water quality control, *Legal aspects, Planning, Management, Water pollution control, Coastal Zone Management Act.

A complex institutional problem has arisen in the management of estuarine resources due to overlapping and contradictory regulatory programs at the federal, state, and local levels. A contributing factor to this problem is the split between regional and community-focused resource management involving state and local land use planning, and specific resource management programs involving federal controls over air and water, and federal review of major construction projects affecting the environment. Noting that state and local government initiatives in control of lands adjacent to estuaries are increasing, and that the federal Coastal Zone Management Act of 1972 was

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designed to bridge the fields of regional and community-focused management and federal resource management both technically and institutionally, the paper concludes that state-level coastal zone management efforts should be upgraded. Further, coordination requirements included in many federal laws should be given more study and financial support to make them effective. (Sinha-OEIS) W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES

Natural Resources Defense Council, New York. A. Macbeth. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 617-627, 62 footnotes.

Descriptors: *Estuarine environment, *Legal aspects, Water pollution control, Water quality control, Regulation.

Estuaries are large scale, highly productive physical systems. Regulation and management of estuarine resources is divided among a multitude of agencies at all levels of government. Federal regulation has operated through expanding the mandate of federal agencies to include review of most estuarine resources and consultation with agencies responsible for them. The weakness of this system lies in (1) the unwillingness of the agencies to accept the expanded mandate; (2) the lack of agency expertise to comply with the expanded mandate; (3) the failure to fully staff and fund the consultation mechanism; (4) unequal distribution of resources between the public, private, and governmental bodies. This can be remedied by funding public groups which contribute to agency proceedings; establishing national estuarine laboratories with mixed research and regulatory responsibilities; and full funding and staffing of the consultation mechanism. (Sinha-OEIS) W78-01812

ESTUARINE MANAGEMENT—THE INTER-GOVERNMENTAL DIMENSION

For primary bibliographic entry see Field 6E. W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES

Georgia Univ., Athens. J. C. Belcher. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 637-656, 2 fig, 5 tab, 16 ref.

Descriptors: *Estuarine environment, Water resources, *Legal aspects, Land use, Waste disposal, Water quality control, Human population, Distribution patterns, Population pressure.

The number of people is not the critical factor in water pollution, but the way the population is distributed and the life patterns that are followed. This report describes the changing distribution of the population of the estuarine counties of the eastern seaboard including the development of new urban structures such as the megalopolis and the creation of new lifestyles brought about by increased leisure time, retirement, second homes, commuting, female participation in the labor force, and changing residential arrangements. (Sinha-OEIS) W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES

Maryland Univ., College Park. J. H. Cumberland. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 659-670, 1 fig, 13 ref.

Descriptors: *Estuarine environment, *Economics, *Management, *Water quality control, Maryland, Water pollution, Coastal zone management, Environmental assessment, National policy.

An economic-environmental systems model for analyzing estuaries which has been used in Maryland to forecast the quantities and types of waste and residuals which will be generated through the year 1985 for the Chesapeake Bay and each of its major tributaries is described. The model indicates that the amount of residuals will be a function of the rate and composition of economic development. Consequently, economic development and growth in the region can be expected to generate water quality problems of increasing magnitude for all estuaries in the U.S. Various corrective policy measures are evaluated for dealing with the environmental threat to the quality of estuarine waters. One of the most serious environmental impacts is aesthetic damage and methods are suggested for applying charges for various levels of aesthetic damage in order to encourage improved qualities of economic development. (Sinha-OEIS) W78-01815

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES

Environmental Protection Agency, Washington, DC. For primary bibliographic entry see Field 2L. W78-01816

EVALUATION OF WATER QUALITY IN ESTUARIES AND COASTAL WATERS

Virginia Inst. of Marine Science, Gloucester Point. W. J. Hargis, Jr. Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Rep No 440/1-77-007B, Mar 1977. Vol 2, p 701-721, 4 fig, 1 tab, 32 ref.

Descriptors: *Estuarine environment, *Water quality control, *Coasts, *Management, Estuarine fisheries, Water pollution control, Legal aspects, Monitoring, *Outer Continental Shelf.

Estuaries and coastal waters, comprising less than 5% of the earth's surface, are under ever-increasing pressures from growing populations and demands. Yet these complex and dynamic waters are the key to preserving the viability and productivity of the oceans. Maintenance of their quality is vital to man and his future, causing much concern, especially in the United States. Consequently, considerable research, legislation, and other efforts oriented at improving management of estuarine and coastal waters have gone forward in the last 10 to 15 years. Despite all these efforts, the condition of estuarine environments and resources continues to decline. Several factors appear to be causal. The 'state of the art' for control of quality in estuarine and coastal waters must be rapidly improved to reverse the downward trend. Recommendations are made. (Sinha-OEIS) W78-01818

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION

University of the Pacific, Dillon Beach, CA. Pacific Marine Station. J. W. Hedgpeth.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 723-737, 23 ref.

Descriptors: *Estuaries, *Estuarine environment, *Water pollution effects, *Water quality, *Environmental effects, Ecosystems, Aquatic life, Waste disposal, Ecology, Pollutants, Wetlands, *Coastal zone, Environmental quality control.

The most significant factor contributing to the degradation of our estuaries is our failure to treat an estuary as a natural system, rather than as a convenience serving man's many and conflicting purposes. This attitude is exacerbated by lack of competence on the part of consultants called upon to predict the results of interfering with natural processes they do not understand in the first place. When this is combined with notions of cost-benefit analysis and trade-offs that justify to ourselves the addition of deleterious substances and chemicals, alteration of temperature and sediment regimes, and spillage of oil, the synergistic action may accelerate the demise of an estuary. (Sinha-OEIS) W78-01819

VARIATION OF 'GILL' SIZE IN LARVAE OF THE AFRICAN MIDGE CHIRONOMUS TRANSVAALENSIS KIEFFER

Newcastle-upon-Tyne Univ. (England). Dept. of Zoology. For primary bibliographic entry see Field 2H. W78-01827

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING

Battelle Columbus Labs., OH. For primary bibliographic entry see Field 5B. W78-01851

MODEL STATE WATER MONITORING PROGRAM

Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div. For primary bibliographic entry see Field 5A. W78-01855

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS)

Arthur D. Little, Inc., Cambridge, MA. For primary bibliographic entry see Field 5A. W78-01887

RECREATIONAL BOATING IN DADE COUNTY 1975-76

Miami Univ., Coral Gables, FL. For primary bibliographic entry see Field 6B. W78-01889

TRANSPORT OF DIGESTED SLUDGE SLURRIES FOR ECONOMIC DISPOSAL, MASS TRANSPORT BY PIPELINE TO DISPOSAL OR TO USE FOR STRIP MINE RECLAMATION

Rand Development Corp., Cleveland, OH. For primary bibliographic entry see Field 5E. W78-01890

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAL SUMMARY.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 977. Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034a, December 1976. 60 p, 5 tab. EPA-68-03-2198.

Descriptors: *Industrial production, *Energy, *Conservation, *Environmental effects, *Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Cost, Evaluation.

Volume I summarizes the other parts of a 15-volume study evaluating the environmental impact of energy conservation measures in 13 energy-intensive industries. Vol. II describes methodology of the overall study, including procedures used in selecting and ranking the industries. Vols. III-XV analyze these industries in detail; alumina and aluminum, ammonia, cement, chlor-alkali, copper, fertilizers, glass, iron and steel, olefins, petroleum, phosphorus, pulp and paper, and textiles. The study concentrates only on major changes likely to be implemented in the next 10-15 years. All such changes would require important process modifications such as improved housekeeping and thermal efficiencies. Conservation is considered possible by either direct thermal savings, or savings achieved by converting from natural gas and light petroleum to heavier petroleum and coal. Some 55 new process options are analyzed in detail, and compared with 25 'baseline' or current processes representing conventional manufacturing techniques. Processes are evaluated according to pollutants emitted, energy requirements, and investment and operating costs for pollution control and basic production. This volume presents the general findings for each industry and also identifies generic or cross-industry technology and further research areas. (See W78-01893 thru W78-01905) (Lynch-Wisconsin) W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II. INDUSTRY PRIORITY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 268. Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034b, December 1976. 124 p, 4 fig, 41 tab, 49 ref, 3 append. EPA 68-03-2198.

Descriptors: *Industrial production, *Energy, *Conservation, *Analytical techniques, *Environmental effects, Methodology, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluation.

Vol. II of a 15-volume analysis of the environmental impact of energy conservation measures in 13 industries describes the study methodology and gives a preliminary overview of the industries. The initial task was to identify industries for detailed analysis, and then to rank them by priority. Criteria for industry selection included: (1) significance of environmental problems in the industry; (2) the likelihood of implementing the process changes identified; and (3) total energy use in the industry. Within each industry chosen, processes subject to change were identified, and those thought to have both significant energy and environmental consequences were selected for in-depth study. A currently practiced 'baseline' technology was then established in each industry for comparison with the new process changes. Energy data gathered are presented in tables. Preliminary conclusions on several industries are also given in this report, prepared early in the

course of the overall study. Industries discussed include: iron and steel (blast furnaces), pulp and paper, industrial organic chemicals (olefins), cement, primary aluminum and alumina, petroleum refining, textiles, glass manufacturing, copper, ammonia, iron and steel foundries, alkalis and chlorine, industrial organic chemicals N.E.C., food, and lime. (See also W78-01892) (Lynch-Wisconsin) W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III. IRON AND STEEL INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 269. Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/76-034c, December 1976. 90 p, 17 fig, 45 tab, 32 ref. EPA 68-03-2198.

Descriptors: *Steel, *Iron, *Energy, *Conservation, *Environmental effects, Technology, Industrial production, Pollution abatement, Costs, Industrial wastes, Baseline studies, Industries, Metallurgy, Sulfur, Evaluations. Identifiers: Coke, Blast furnaces, Carbon monoxide.

Environmental impacts of four manufacturing process changes which could possibly conserve energy are assessed for the iron and steel industry, as part of a broader study of 13 energy-intensive industries. Process options analyzed are: (1) recovery of carbon monoxide from basic oxygen process (BOP) vessels in steelmaking; (2) external desulfurization of blast furnace hot metal; (3) conversion from wet to dry process for quenching of coke; and (4) direct reduction of iron ore. Recovery of carbon monoxide from BOP vessels would provide a supplementary fuel source as well as better gas cleaning efficiency. It probably will be widely adopted in new facilities. External desulfurization allows for utilization of higher sulfur coke in the blast furnace, or reduction of the coke rate and limestone consumption. Fugitive air and water pollution streams would all little to overall pollution. This option probably will also be adopted. Dry quenching of coke, essentially an energy-saving measure, may pollute less than wet quenching but would require prohibitively-high capital investment and is not likely to be considered by any but large integrated plants. Direct reduction of iron ore through the rotary kiln-electric furnace method eliminates a major pollution source, the coke oven, and uses lower-valued coals but is more energy-consuming. As it is not yet perfected technically, it is not likely to be adopted in the next 15 years. (See also W78-01892) (Lynch-Wisconsin) W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV. PETROLEUM REFINING INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 270. Price codes: A09 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034d, December 1976. 171 p, 18 fig, 86 tab, 6 append. EPA68-03-2198.

Descriptors: *Oil, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Asphalt, Industries, Technology, Industrial wastes, Effluents, Baseline studies, Alternative planning, Costs, Evaluation. Identifiers: *Refining, Hydrocracking, Flexicoking, Desulfurization.

Five potential energy-saving processes in petroleum refining are evaluated for environmental impact as part of broader study of 13 energy-inten-

sive industries; (1) direct combustion of asphalt in process heaters and boilers; (2) hydrocracking of vacuum bottoms (H-oil); (3) flexicoking of vacuum bottoms; (4) internal electric power generation; and (5) hydrogen generation by partial oxidation. All five alternatives generally are net consumers of energy in a thermodynamic sense, especially considering pollution control energy consumption. Reduction in refinery efficiency is slight, except for flexicoking of vacuum bottoms, which results in 2% lower efficiency. Energy form value upgrading is the principal conservation benefit, accomplished through utilization or conversion of refinery residue streams with a corresponding net increase in the availability of higher-valued fuels (such as refinery gas and distillate range products). Implementation of these five options would have little impact on wastewater-control costs, as they do not change treated effluent characteristics. Options (1) and (4) significantly increase total operating costs; in the case of (1) flue gas desulfurization accounts for over half of the total operating cost. Improving reliability and reducing the cost of flue gas desulfurization is the most important area for further research. (See also W78-01892) (Lynch-Wisconsin) W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V. PULP AND PAPER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 271. Price codes: A10 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034e, December 1976. 186 p, 15 fig, 80 tab, 3 append. EPA 68-03-2198.

Descriptors: *Pulp and paper industry, *Energy, *Conservation, *Environmental effects, Recycling, Pulp wastes, Industrial production, Pollution abatement, Effluents, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.

Environmental impacts of technological modifications which offer energy-conserving potential to the pulp and paper industry are evaluated as part of a broader study of 13 energy-intensive industries. A preliminary assessment is included of some 60 process changes and their stages of development, together with a detailed analysis of four alternatives likely to have significant energy and environmental impact in the near future: (1) alkaline-oxygen (A-O) pulping; (2) Rapson effluent-free kraft process; (3) thermo-mechanical pulping (TMP); and (4) de-inking of old newsprint for reuse. The A-O process would eliminate sulfur and odor associated with the kraft recovery process, and improve the color problem of the caustic/chlorine bleach system; air emissions and solid waste would not be reduced. The Rapson process is designed to eliminate BOD, suspended solids, and color from chlorine/caustic bleach system effluents, but would not affect solid waste or air emissions. The TMP process is considered the most important as energy use and costs would be greatly reduced. TMP causes no net change in energy use or pollution, but produces a stronger pulp. De-inking of old newsprint conserves energy and virgin fiber, creates no odor, and reduces household waste. Alternative paper-drying methods and displacement washing have significant energy-saving potential. (See also W78-01892) (Lynch-Wisconsin) W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI. OLEFINS INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 272. Price codes: A08 in paper copy, A01 in microfiche.

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Report No EPA-600/7-76-034f, December 1976. 134 p, 29 fig, 65 tab, 6 append. EPA 68-03-2198.

Descriptors: *Chemical industry, *Energy, *Conservation, *Environmental effects, Coals, Natural gas, Technology, Pollution abatement, Industrial production, Industrial wastes, Baseline studies, Costs, Alternative planning, Propane, Evaluations.

Identifiers: *Olefins, *Ethylene, Feedstocks, Naphtha, Ethane, Organic chemicals, Gas oils.

The olefins industry, the largest subgroup among industrial organic chemicals, is analyzed for environmental impact of an expected change in energy form values from lighter to heavier feedstocks, as part of a broader study of 13 energy-intensive industries. Most ethylene (80%) in the U.S. is produced from the pyrolysis of ethane and propane, derived mainly from natural gas. Projected natural gas shortages will mean conversion to heavier feedstocks such as naphtha and atmospheric gas oil. These contain more impurities (especially sulfur) and therefore would have a greater adverse effect on the environment. Environmentally acceptable control technology exists for operating heavy liquid olefin crackers; but the estimated aggregate cost of these controls (0.5-1.75% of total production costs) is high, considering the large amount of ethylene produced—23 billion lbs in 1975. Heavier feedstock cracking is also expected to cost 30% more than cracking of lighter feedstocks. The report concentrates on new technology for producing olefins from heavier, more available, and less costly feedstocks than ethane-propane, naphtha, and atmospheric gas oil, including vacuum gas oil, vacuum residues, crude oil, and coal. New processes reviewed were: coil cracking, fluid bed cracking, autothermal cracking of heavy petroleum-based feedstocks, plasma cracking and byproduct production from coal. Gross energy demand for producing ethylene increases as feedstock quality decreases, and form value displacement is the only energy conservation achieved. (See also W78-01892) (Lynch-Wisconsin)

W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII. AMMONIA INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 273, Price codes: A06 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034g, December 1976. 88 p, 16 fig, 45 tab. EPA 68-03-2198.

Descriptors: *Ammonia, *Energy, *Conservation, *Environmental effects, Natural gas, Coals, Industrial production, Pollution abatement, Technology, Industries, Industrial wastes, Sulfur, Baseline studies, Alternative planning, Costs, Evaluations.

Identifiers: Coal gasification, Fuel oils.

Shortages of natural gas, the basic feedstock for virtually all ammonia production in the United States, is forcing the ammonia industry to look to alternate sources such as coal and heavy fuel oil. This report, part of a broader study of 13 energy-intensive industries, evaluates environmental and economic impacts of converting ammonia production to gasification of coal or heavy oil. These alternatives are not economically attractive; estimated incremental capital investment above the current \$186 per annual ton of ammonia based on natural gas is \$111 per annual ton for coal gasification and \$21 per annual ton for heavy fuel oil. Estimated incremental production costs are \$17 per ton for coal, including \$8.65 per ton for pollution control, and \$45 per ton for heavy fuel oil with \$3.46 for pollution control. Needed pollution control measures will require an energy expenditure of 165,000 Btu per ton of ammonia for coal, a 0.5% increase in total energy consumption in ammonia

production, and 125,000 Btu per ton for heavy fuel oil, a 0.2% increase in total energy consumption. Therefore, the relative incremental fuel use would be negligible, but fuel form savings would be significant. The most important potential environmental problem for both alternatives is byproduct sulfur, but a sulfur recovery system could handle this in an acceptable manner. (See also W78-01892) (Lynch-Wisconsin)

W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII. ALUMINA/ALUMINUM INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 274, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034h, December 1976. 139 p, 8 fig, 38 tab, 3 append. EPA 68-03-2198.

Descriptors: *Aluminum, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.

Identifiers: *Alumina, Bayer process, Hall-Heroult process, Alcoa chloride process, Clay chlorination.

Environmental impacts of energy-saving production alternatives are examined for the alumina/aluminum industry as part of a larger study of 13 energy-intensive industries. Two basic independent operations at separate facilities comprise the aluminum industry: production of alumina (Al₂O₃) from bauxite by the Bayer process, and reduction of alumina to aluminum metal by the Hall-Heroult electrolytic reduction process. Bauxite is now in short supply. Accordingly, alternatives to the Bayer process are based on clay as a raw material instead of bauxite. Alternatives include treatment of clays by: (1) hydrochloric acid leaching; (2) nitric acid leaching; and (3) high temperature chlorination (Toth process). Alternatives to the energy-consuming Hall process include: (1) Alcoa chloride process; and (2) use of titanium diboride cathodes. A combination of clay chlorination and Alcoa chloride processes would result in considerable cost savings along with a decrease in both air pollution and energy consumption. All the new alumina processes would produce more solid waste and involve higher pollution control costs than the Bayer process, but with proper plant location, wastes could be returned to the mined-out areas. Lowest energy consumption and operating costs are associated with the clay chlorination method. The Alcoa chloride process could realize energy savings of 10% without increasing operating costs. (See also W78-01892) (Lynch-Wisconsin)

W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 275, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034i, December 1976. 76 p, 11 fig, 27 tab, 2 append. EPA 68-03-2198.

Descriptors: *Textiles, *Energy, *Conservation, *Environmental effects, Cotton, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Fabrics, Evaluations.

Identifiers: Polyester, Weaving, Knitting.

Alternative energy-saving textile processing operations are assessed for environmental impacts as part of a broader study of 13 energy-intensive industries. In 1971 total energy use by the industry

was about 0.54 quads. About 60% of energy consumption is in wet operations, such as fabric preparation, dyeing, and finishing; a major fraction is spent in heating and evaporating water, so water conservation or elimination of its use is a critical variable. Three energy-conserving process alternatives were analyzed: (1) integrated knit fabric mills using advanced processing (minimizing water use) of polyester; (2) integrated knit fabric mills using solvent processing of polyester; and (3) integrated woven fabric mills using advanced processing of a 50-50 polyester-cotton mixture. These alternatives were compared with current manufacturing practices. Advanced processing offers lower energy and pollution control costs in return for a somewhat higher capital investment and could be adopted beneficially for replacement capacity and capacity expansion. Advanced processing of knit fabrics results in a 50% reduction in energy use. Advanced processing of woven fabrics results in a 57% reduction in energy consumption as well as lower costs for energy and pollution control. All-solvent processing of knit fabrics offers 70% energy savings and practically eliminates water pollution problems but potential solvent losses and technical development limitations inhibit widespread application. (See also W78-01892) (Lynch-Wisconsin)

W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 276, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034j, December 1976. 116 p, 19 fig, 38 tab, 4 append. EPA 68-03-2198.

Descriptors: *Concrete, *Cements, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Fuels, Coals, Evaluations.

Identifiers: Suspension preheaters, Flash calciners, Fluidized-bed cement process, Clinker production, Rotary kilns.

Three energy-saving manufacturing changes in the cement industry were evaluated for economic and environmental impacts as part of a larger study of 13 energy-intensive industries. The unit process of clinker production, which consumes in the form of fuel 80% of total cement industry energy requirements, is the focus of this report. Alternatives analyzed were: (1) suspension preheaters, (2) flash calciners; and (3) the fluidized-bed cement process. All the alternatives investigated require a lower fixed capital investment, use less total energy, and would probably have lower pollution control costs than the conventional long rotary kiln now in use. Effluent quantities and composition would be essentially the same as with the long rotary kiln. Suspension preheater-equipped rotary kilns, which fell into total disfavor in the U.S. due to technical problems which have since been overcome, largely eliminates process water discharge and waste kiln dust problems. The flash calciner, a variation of the suspension preheater rotary kiln, is likewise a dry process. The fluidized-bed cement process replaces the rotary kiln entirely. Conversion from oil and natural gas to coal fuel was also considered. Coal, which was progressively displaced by oil and natural gas, is now again becoming a major fuel in the industry; could replace all of the oil and natural gas now being used. Conversion to coal would require additional storage and handling expense, and fugitive emissions and runoff would be likely to increase pollution control costs. (See also W78-01892) (Lynch-Wisconsin)

W78-01901

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI. GLASS INDUSTRY.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 277, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-034k, December 1976. 111 p, 9 fig, 40 tab, 42 ref, 4 append. EPA 68-03-2198.

Descriptors: *Energy, *Conservation, *Environmental effects, *Fuels, Natural gas, Electric power, Industrial production, Pollution abatement, Air pollution, Technology, Industries, Industrial wastes, Baseline studies, Alternative planning, Costs, Coals, Evaluations. Identifiers: *Glass industry.

Five glass-manufacturing process alternatives based on coal or electric power rather than natural gas are evaluated in terms of economic and environmental effects, as part of a broader study of 13 energy-intensive industries. These alternative energy forms are based on the unit process of melting, which consumes 60-80% of total glass industry energy requirements: (1) coal gasification, (2) direct coal firing, (3) coal hot gas generation, (4) electric melting, and (5) batch preheating. The alternatives were compared to a conventional process using natural gas in a 200 tpd side-port fired regenerative furnace, melting soda-lime-silica glass. All except (5) require higher energy input per ton of glass produced, but involve less-critical energy sources. Emissions from the glass tank—primarily sulfur oxides and particulates—are increased, indicating higher pollution control costs. Coal gasification and coal hot gas generation may be economically unfeasible because of high facility conversion and pollution control costs. Direct coal firing involves higher capital and operating costs, as well as serious technical problems. Electric melting results in the lowest air emission loads. The form is less critical in spite of a 12% increase in energy consumption, making this option economically and technically feasible. Batch preheating reduces melting energy use by 20%, and can be used with any of the alternative energy forms. (See also W78-01892) (Lynch-Wisconsin) W78-01902

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII. PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 279, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-034m, December 1976. 80 p, 12 fig, 26 tab, 26 ref. EPA 68-03-2198.

Descriptors: *Phosphorus, *Energy, *Conservation, *Environmental effects, Fertilizers, Electric power, Phosphates, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations. Identifiers: *Phosphoric acid.

Energy-saving alternatives in the phosphorus/phosphoric acid industry are analyzed for economic and environmental effects, as part of a broader study of 13 energy-intensive industries. Phosphate rock is converted to phosphoric acid with sulfuric acid (wet process), or reduced to elemental phosphorus in an electric furnace and subsequently converted to phosphoric acid. Unpurified wet-process acid is suitable only for fertilizer manufacture, while furnace acid is pure and is used in detergents, food, and fine chemicals. The furnace process consumes five times more energy than the wet process; alternatives were therefore geared to wet-process improvements: (1) chemical cleanup of phosphoric acid, (2) solvent extraction

for wet-process acid, (3) byproduct sulfuric acid use, and (4) the strong acid system. Chemical cleanup seems economically feasible, pollution problems would not be increased, and energy savings over the furnace method would be substantial. Solvent extraction is not a well-established system, but seems economically feasible and would result in significant energy savings. Use of byproduct sulfuric acid instead of sulfur in the wet process would produce phosphoric acid competitive with normal wet-process acid. The strong acid method which uses phosphoric acid concentrations of 50% P2O5 in the wet process, may be competitive with the standard process; as evaporation of the product acid is not necessary, energy savings are realized. (See also W78-01892) (Lynch-Wisconsin) W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 280, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-034n, December 1976. 124 p, 26 fig, 47 tab, 39 ref, 2 append. EPA 68-03-2198.

Descriptors: *Copper, *Metallurgy, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations. Identifiers: Outokumpu process, Noranda process, Mitsubishi process, Arbitrator process.

Six manufacturing alternatives for primary copper industry smelting and refining are evaluated in terms of economic and environmental effects, as part of a larger study of 13 energy-intensive industries: (1) Outokumpu flash smelting, (2) Noranda process, (3) Mitsubishi process, (4) oxygen use in smelting, (5) metal recovery from slag (flotation or electric furnace), and (6) Arbitrator process. The first three are all pyrometallurgical processes using exothermal reactions which occur during smelting to reduce net energy requirements about 30% (or 50% when oxygen enrichment is used). These methods produce only a concentrated SO2 stream, which can be treated efficiently for SO2 recovery by conversion to sulfuric acid. A 90% sulfur capture is possible, compared with 50-70% for conventional smelting. However, applicability of these processes to impure concentrates is unproven. Oxygen use in smelting results in net energy savings, as increased energy demand for oxygen separation is more than offset by the decrease in smelting fuel requirements. Disadvantages include higher operating temperatures and therefore increased maintenance. The two slag metal recovery processes eliminate the need to maintain a low matte grade in the primary smelting unit. The Arbitrator process is less polluting and can operate on a small scale, but uses more energy than conventional technology. (See also W78-01892) (Lynch-Wisconsin) W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT.

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 281, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-034o, December 1976. 60 p, 10 fig, 26 tab. EPA 68-03-2198.

Descriptors: *Fertilizers, *Energy, *Conservation, *Environmental effects, *Air pollution, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes,

Baseline studies, Alternative planning, Costs, Agricultural chemicals, Evaluations.

A report on possible energy-saving alternatives to current production methods in the fertilizer industry concludes that no feasible options are available, and identifies two cases where environmental regulations and energy conservation are in conflict. This investigation is part of a larger study of 13 energy-intensive industries. Most of the industry's energy consumption and costs are in raw materials, not in the subsequent processes. No process changes are foreseen solely for reasons of energy conservation. Two areas were analyzed in which environmental regulations and energy conservation conflict: (1) reduction of nitrogen oxide emissions from nitric acid plants, and (2) conversion from natural gas to fuel oil for firing fertilizer dryers, where bag filters are used for emission control. Catalytic decomposition of nitrogen oxides, the most widely used emission control method in nitric acid plants, is capital and energy intensive, and depends on natural gas. Most plants are limited in their purchase of natural gas and production of ammonia is thereby curtailed. All other abatement systems suffer from various technical problems. The shift from natural gas to fuel oil in the 10-20% of ammoniation granulation fertilizer plants using bag filters instead of wet scrubbers has caused operational problems due to filter clogging. (See also W78-01892) (Lynch-Wisconsin) W78-01905

AQUATIC WEED PROBLEMS IN PUERTO RICO.

Office of the Chief of Engineers (Army), Washington, DC. E. O. Gangstad. Journal of Aquatic Plant Management, Vol. 15, p 3-5, June 1977. 11 ref.

Descriptors: *Puerto Rico, *Aquatic weed control, *Water hyacinth, Aquatic weeds, Rivers, Reservoirs, Watersheds(Basins), Alligatorweed, Biocontrol, Insects, Herbicides, 2,4-D, Dalapon, Water quality. Identifiers: *Eichhornia crassipes, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila.

Water hyacinth (Eichhornia crassipes) is the primary aquatic weed problem in Puerto Rico, but when it is brought under control alligatorweed (Alternanthera philoxeroides) is likely to become a problem. Major aquatic weed problem areas are along the north coast of the island from Rio Grande to Arecibo. Lesser infestations are found in the river systems of the south from Naguabo to Ponce and from Mayaguez through Valle de Lajas to Yauco. There are few problems in the streams and lakes of the mountainous interior. Major infested reservoirs include Lago de Cidra, Lago de Loiza, Lago de la Plata, Lago dos Bocas, Lago Coamo, and Laguna Cartagena. Introduction of the alligatorweed flea beetle (Agasicles hygrophila) for control of alligatorweed was recommended in 1968 by the U.S. Army Corps of Engineers. Drainage canals of the Lajas Valley are infested with paragrass (Panicum purpurascens), water smartweed (Polygonum natans), and cattails (Typha spp.). The use of dalapon and 2,4-D was recommended by the U.S. Department of Agriculture for control of these weeds. Water hyacinth infestations in the following watersheds are assessed: Rio Grande de Loiza, Rio de Bayamon, Rio de la Plata, Rio Grande de Manati, and Rio Grande de Arecibo. (Lynch-Wisconsin) W78-01921

WATER HYACINTH CONTROL ON THE LOWER FITZROY RIVER.

Queensland Dept. of Primary Industries, Rockhampton (Australia). G. I. Jamieson, C. Kershaw, and R. J. Ciesiolka. Journal of Aquatic Plant Management, Vol. 15, p 5-9, June, 1977. 2 fig, 2 ref.

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Descriptors: *Water hyacinth, *Aquatic weed control, *Chemcontrol, Rivers, Florida, 2,4-D, Herbicides, Diquat, Paraquat, 2,4-D, Equipment. Identifiers: *Eichhornia crassipes, *Fitzroy River (Australia), Australia, Salvinia molesta, Neochetina eichhorniae, Water hyacinth weevil.

The Fitzroy River Basin (Queensland), the second largest in Australia, drains a 143,000 sq km area containing numerous water hyacinth-infested lagoons. In 1970 a dam was erected 61 km above the river mouth to prevent saltwater tidal flow from the Pacific Ocean from entering the river, and to create a 63,600-megaliter freshwater reservoir. The reservoir now provides the water supply for Rockhampton, and also for industry and agriculture. By late 1973 for 50 km above the dam the river was completely covered by water hyacinth colonized from the lagoons and swamps of the flood plain. Flooding in early 1974 allowed flushing of most of the water hyacinth out to sea by opening the dam gates, and enabled initiation of a control program. Various methods were investigated, and the beetle *Neochetina eichhorniae* was experimentally released in the summer of 1975-76. A chemical spraying system proved the most effective, however. Diquat is used in the water storage area at 2.8-5.5 l/ha, with up to 5.5 l of a non-ionic wetting agent. In other areas 2,4-D 50% amine is applied at 11 l/ha with ionic or non-ionic wetting agent. Wetting the plants thoroughly is vital. *Salvinia* is becoming a problem as water hyacinth is brought under control, as it is immune to diquat and 2,4-D. Where *Salvinia* infestation is likely, paraquat is combined with diquat to control both plants. Equipment is discussed. Using these methods, the river has been virtually cleared of water hyacinth. (Lynch-Wisconsin)

WATER HYACINTH CONTROL PLAIN FOR THE ST. JOHNS RIVER,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
C. F. Zeiger, and J. T. McGeehee.
Journal of Aquatic Plant Management, Vol. 15, p 10-12, June, 1977.

Descriptors: *Water hyacinth, *Aquatic weed control, *Chemcontrol, Rivers, Florida, 2,4-D, Herbicides, Biocontrol, Mechanical control, Spraying, Fish. Identifiers: *St. Johns River (FL), *Eichhornia crassipes, Water hyacinth weevil, *Neochetina eichhorniae*.

Water hyacinth (*Eichhornia crassipes*), a serious problem on the St. Johns River, FL, since shortly after it was introduced in 1890, currently is controlled at a maintenance level through selective spraying with the herbicide 2,4-D. The U.S. Army Corps of Engineers controls plants on the river from Jacksonville to Lake Harney under the Removal of Aquatic Growth Project. From Lake Harney to the headwaters work is done by the Florida Game and Fresh Water Fish Commission under the Aquatic Plant Control Program. Operations are designed to interfere as little as possible with public use patterns, manatee migrations, and fishing and spawning seasons. Treatment is directed to heavily infested areas and to lakes or wide reaches of the river where plants are moved about by the wind, and not to single plants, scattered mats, narrow reaches flushed by current, or tributaries and coves not essential to navigation. The water hyacinth weevil (*Neochetina eichhorniae*), released on the river in March-April 1976, does not eliminate the plant, but helps control rapid growth. Mechanical harvesters have not been successful, but future designs will be used where effective. Earlier control methods, tried but discarded, included destroyer boats with saw blade shredders, burning with kerosene, and spraying with a variety of substances, including highly toxic sodium arsenite (1902-05), steam and whale oil soap. (Lynch-Wisconsin)

W78-01923

SELECTED LIFE CYCLE FEATURES OF FANWORT,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4A.
W78-01924

EFFECTS OF CONSECUTIVE WATER FLUCTUATIONS ON SUBMERSED VEGETATION OF BLACK LAKE, LOUISIANA,
Florida Dept. of Natural Resources, Tallahassee.
T. L. Goldsby, and D. R. Sanders, Sr.
Journal of Aquatic Plant Management, Vol. 15, p 23-28, June, 1977. 2 fig, 4 tab, 15 ref. Army Corps of Engineers, DACW29-72-CO186.

Descriptors: *Fluctuations, *Water levels, *Drawdown, *Reservoirs, *Aquatic weed control, Submerged plants, Louisiana, Impoundments. Identifiers: *Black Lake (LA), *Cabomba caroliniana*, *Egeria densa*, Floating bladderwort, *Utricularia inflata*, Coontail, *Ceratophyllum demersum*.

Consecutive drawdowns in a Louisiana reservoir were more effective in controlling aquatic plants than an individual drawdown. Black Lake, a 5,460-ha reservoir located 19 km northeast of Natchitoches, LA, was created by the impoundment of Black Bayou in 1930. Stabilization of water level resulted in severe infestations of *Cabomba caroliniana*, floating bladderwort (*Utricularia inflata*), and *Egeria densa*. Water level fluctuations through drawdowns were used as a control measure. The first drawdown, initiated July 20, 1972, lowered the water level 2.4 m; the second, September 3, 1973, lowered the level 2.6 m. In each case heavy rains beginning in November resulted in refilling to 2.1-3.0 m above normal pool stage. The first drawdown virtually eliminated both *egeria* and *cabomba*. *Egeria* was eradicated after the second, but due to the seed dormancy of *cabomba*, two drawdowns are not likely to have eradicated the plant. Floating bladderwort was reduced or eliminated in deeper water by the two drawdowns, but in shallow water it tended to increase as a result of the reduction or elimination of the more competitive *egeria* and *cabomba*. Coontail was successfully controlled by the consecutive drawdown, although it increased in shallow water after the first drawdown. Both muskgrass and slender spikegrass displayed net increases after the two drawdowns, although neither were serious problems. (Lynch-Wisconsin)

W78-01925

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-01928

MANAGEMENT OF AQUATIC PLANTS WITH ACROLEIN,
Water Resources Commission, Griffith (Australia).
K. H. Bowmer, and G. R. Sainty.
Journal of Aquatic Plant Management, Vol. 15, p 40-46, June, 1977. 4 fig, 5 tab, 20 ref.

Descriptors: *Herbicides, *Aquatic weed control, Submerged plants, Irrigation canals, Toxicity, Efficiency, Safety factors. Identifiers: *Acrolein, *Acrylaldehyde, *Dosage, Australia, Floating pondweed, *Potamogeton tricaratus*, Ribbonweed, *Vallisneria spiralis*, *Elodea canadensis*.

Acrolein (acrylaldehyde), an extremely toxic general biocide, is widely used in Australia to control submerged plants—especially *Elodea canadensis* in irrigation canals; a method of calculating the quantity of acrolein required for various conditions is described, and economic and safety aspects of its use is discussed. Acrolein destroys vital enzyme systems on contact with plant cells, causing tissue disintegration; it is also extremely toxic to fish. Acrolein dissipates from water through volatilization, adsorption, degradation, and dilution. The equation $E \text{ sub } o - E \text{ sub } L \text{ exp } (Kt)$ can be used to calculate the dosage required at the injection point ($E \text{ sub } o$), where $E \text{ sub } L$ is the minimum lethal dosage which must be maintained at the downstream limit, K is the acrolein dissipation constant (0.16/hr), and t is the time taken for the herbicide to travel through the weed-infested stretch. The value of $E \text{ sub } L$ is discussed for various plants and using multiple additions; it is suggested that for single injections, 2 ppm x hr may be used for *E sub L*. Ribbonweed (*Vallisneria spiralis*) and floating pondweed (*Potamogeton tricaratus*) require higher doses. In tank experiments 80% control of *V. spiralis* was obtained with 3.7 ppm for 1 hr; *P. tricaratus* required 2 ppm for 12 hr or 15 ppm for 1.7 hr. (Lynch-Wisconsin)

W78-01929

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO EGGS, ALEVINS, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES,
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01932

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
L. L. Mink, C. M. Gilmour, S. M. Beck, J. H. Milligan, and R. L. Braun.
Ground Water, Vol. 14, No. 6, p 411-425, November-December, 1976. 11 fig, 9 tab, 30 ref.

Descriptors: *Feedlots, Waste disposal, Idaho, Runoff, Groundwater, Water quality control, Nutrients, Fertilizers, Coliforms, Sprinkler irrigation, Farm wastes. Identifiers: *Boise River Valley (ID), *Land disposal, Nonpoint pollution.

Two feedlots in Boise River Valley (ID), where much surface water is diverted for irrigation, were analyzed to determine effects of feedlot waste on the subsurface environment. Ground water levels below Feedlot A, on the floodplain, were less than five ft from the surface, while beneath Feedlot B,

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located on an alluvial terrace, depth to ground water was over 80 ft. Ground water beneath Feedlot A was affected by the feedlot. However, since transmissivity and thickness of the aquifer were not determined accurately, total contribution of pollutants could not be evaluated. Ground water below Feedlot B was not analyzed, but water degradation was probably low, as no high concentrations of the various chemical constituents analyzed were found in soil samples below 23 ft. In locating feedlots the following instructions should be followed. Slopes over 12% should be avoided to prevent erosion and incomplete formation of the organic mat. Slopes of 2-3% are recommended to minimize ponding. Basalt outcrops should be avoided since ground water contamination could occur through open fractures. The manure pack and especially the semipermeable organic mat should be maintained to reduce infiltration and minimize ground water degradation. Land disposal requires a water table deeper than 5 ft; applications of 40-50 tons/acre/yr should be made in late fall. Surface runoff should be channeled to lined settling ponds in steep, narrow ditches. (Lynch-Wisconsin)
W78-01948

WEST VIRGINIA ACID MINE DRAINAGE STUDY IN NORTH POTOMAC RIVER BASIN.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 5B.
W78-01959

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I, FLORA AND CHEMISTRY.
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W78-02007

SUBSTITUTION AND THE CONTROL OF POLLUTION.
State Univ. of New York at Albany. Dept. of Economics.
G. W. Yohe.
Journal of Environmental Economics and Management, Vol. 3, No. 4, p 312-324, December 1976. 6 ref.

Descriptors: *Input-output analysis, *Mathematical models, Economics, Prices, Pollution abatement.
Identifiers: *Substitution, *Price control, *Quantity control, Certainty, Uncertainty.

The relative efficacy of price and quantity controls to handle pollution are examined, where prices are effluent charges and quantities are pollution standards. But using one variable to represent both the pollutant and the positive product by a single variable is inappropriate unless they appear in fixed proportions. In addition, the quantity of a pollutant actually being consumed is typically related to the quantity produced by a variety of weather-related variables, which is a significant source of uncertainty thus far ignored. To ensure that the two alternative controls produce precisely the same outcome, a one-firm model is first generated under certainty. Three basic sources of uncertainty are identified: benefits generated by consuming the final good; the social costs of consuming the pollutant; and the cost of removing pollutants from emission streams. Although pollutants are generally modeled as secondary outputs, economically they behave more like inputs. Compensation must be paid by the producer to the public for pollution, and so pollution is a necessary input in production. The ability to substitute other inputs for the pollutant is found to influence the degree to which cost fluctuation is reflected in the output of the final good. The usual discrepancy between the amounts of pollution actually con-

sumed and emitted alters the region of benefit function into which output is inserted. (Lynch-Wisconsin)
W78-02011

THE RECREATION BENEFITS OF WATER QUALITY IMPROVEMENTS: ANALYSIS OF DAY TRIPS IN AN URBAN SETTING.
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 6B.
W78-02016

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN.
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordinator.
S. C. Andrews, R. G. Christensen, and C. D. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 293, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-905/9-76-002, February 1976. 146 p, 8 fig, 38 tab, 17 maps, 4 append. G005140 01.

Descriptors: *Clays, *Water pollution control, *Lake Superior, *Sedimentation, Wisconsin, Minnesota, Streams, Water quality control, Pollutants, Suspended solids, Education, Methodology. Identifiers: *Nonpoint pollution, Red clay area(MN WI), Public information.

Research and demonstration projects carried out by the Soil and Water Conservation Districts of Ashland, Bayfield, Douglas, and Iron Counties in Wisconsin, and Carlton County in Minnesota is described. Erosion of red clay soils on the south shore of Lake Superior have created serious problems in road and railroad building, agriculture, and lake and stream sedimentation. The first systematic study of land use problems in this area of southwestern Minnesota and northwestern Wisconsin was begun in the mid-1950s when an Interagency Red Clay Committee was formed. Suspended clay in lakes and streams was first recognized as a pollutant about 1970, and the committee was requested to inventory the extent of sedimentation and outline a plan for reducing sediment pollution; other local agencies also began work on the problem. Surveys led to selection of sites in target watersheds for assessing various structural and nonstructural erosion and sedimentation control techniques. Areas studied were Nemadji River basin, Fish Creek watershed, Oronto/Parker Creek basin, and the Ashland shoreline. For each study area a general description is followed by a discussion of land capability, streambank erosion, land treatment needs, demonstration projects, research, monitoring, and work plan time schedule. Final sections discuss information dissemination and education, institutional management systems, analytical methods, and budget. (Lynch-Wisconsin)
W78-02017

MEETING THE GROUNDWATER CONTAMINATION PROBLEM.
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-02031

PERMISSIBLE CONCENTRATIONS OF ALCOHOLS AND FURFURAL IN WASTE WATER USED FOR IRRIGATION (O DOPUSTIMOM SODERZHANIY SPIRTOV I FURFUROLA V STOCHNYKH VODAKH, ISPOL'ZUEMYKH DLYA OROSHENIYA).
For primary bibliographic entry see Field 5E.
W78-02037

A MEAT PACKER'S SOLUTION TO MEETING 1983 EFFLUENT REQUIREMENTS.
Foth and Van Dyke and Associates, Inc., Green Bay, WI.
For primary bibliographic entry see Field 5D.
W78-02089

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations; and Environmental Protection Agency, Washington, DC. Oil and Special Materials Control Div.
March 1977. 42 p, 32 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution, Oil water, Poisons, Waterfowl, Oil wells, Oil-water interfaces, Disasters, Oil wastes, Barges, Water pollution treatment, Secondary recovery(Oil), Aquatic life, Wildlife, Water law, Storage tanks, Hazards, Explosions, *Environmental Protection Agency, *Marine environment, *Hazardous substances(Pollution), *Tankers, Marine ecosystem, Point sources(Pollution), Supertankers, Vessels, Oil spill cleanup.

The objective of the Oil and Special Materials Control Division of the Environmental Protection Agency is the protection of water quality through the prevention of spills and the minimization of the impact of spills on the environment. The three major goals of the federal program are to prevent spills, to detect spills, and to contain, remove, and clean up those spills which do occur. To fulfill the public information aspect of these goals, survey sections are presented which describe some of the more significant spill incidents and the mechanisms, both managerial and technological, to deal with them. Specifically, sections concerning the effects of spills, the prevention of spills, the response to spills, and spill surveillance are included. In addition, a catalog of the major spills of oil and hazardous substances occurring in the 1960's and 1970's, along with their causes and consequences are briefly discussed. A list of references to more detailed presentations of the laws, regulations, and other subjects pertaining to spills is included. (Brightman-Florida)
W78-02095

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY.
Black and Veatch, Kansas City, MO.
O. J. Schmidt.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 1, No. 6, p 935-46, December, 1975.

Descriptors: *Water quality, *Kansas, *Missouri, *Water pollution control, *Sewage districts, Management, Coordination, Septic tanks, Water quality control, Wastewater treatment, Municipal wastes, Waste treatment, Inter-agency cooperation, Water management(Applied), Watershed management, City planning, Interceptor sewers, Sewage treatment, Tertiary treatment, Watersheds(Basins), *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972.

Neighboring communities within one watershed need to share responsibility for water pollution control. Problems result from fragmented efforts at pollution control. For instance, political boundaries pose obstacles to coordinated, well-planned pollution control programs. Differing policies of treatment standards and differing methods of financing construction develop when political and administrative boundaries do not coincide with watershed boundaries. Also, a lack of support programs, such as laboratory facilities and monitoring programs, results in a lack of data on plant performance. After examining these and other problems the author examines options for management agencies which would reduce fragmentation

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W78-02104

E.P.A. ENFORCEMENT, DECEMBER 1972 TO NOVEMBER 1974. AIR, WATER, PESTICIDES. Environmental Protection Agency, Washington, DC. Office of General Counsel. Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 948, Price codes: A18 in paper copy, A01 in microfiche. 1975. 398 p.

Descriptors: *Law enforcement, *Pollutants, *Water pollution, *Pesticides, Air pollution, Air pollution effects, Administrative agencies, Federal government, Effluents, Wastes, Discharge(Water), Liquid wastes, Judicial decisions, Legal aspects, Legal review, Penalties(Legal), Water law, Permits, Water pollution control, Water pollution effects, *Environmental Protection Agency, Environmental policy, Administrative regulations, Effluent limitations, Federal Water Pollution Control Act Amendments of 1972, Effluent guidelines, National Pollution Discharge Elimination System.

Several broad pollution status were passed in 1972 placing extensive enforcement responsibility upon the Environmental Protection Agency (EPA). The Federal Water Pollution Control Act Amendments of 1972 established a permit requirement for discharges into United States water. The Marine Protection, Research and Sanctuaries Act created safeguards against pollution of marine waters. The Federal Environmental Pesticide Control Act strengthened provisions governing the use of hazardous substances. This report reviews the EPA's enforcement efforts over the two-year period from December 1972 through November 1974 in the major program areas of air, water, and pesticide pollution. The publication includes a basic summary of enforcement actions and their results, a specific discussion of stationary and mobile air pollution sources, a review of the National Pollutant Elimination Discharge System permit program and enforcement actions against its violators, and also a specific analysis concerning pesticide pollution violators. The report concludes with several statistical tables and charts. (Moorhouse-Florida) W78-02105

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT). Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 514, Price codes: A99 in paper copy, A01 in microfiche. EPA/440/9-75/009. November 1975. 783 p, 453 ref.

Descriptors: *Toxicity, *Chemical analysis, *Chemicals, *Data collections, Salts, Chemical wastes, Persistence, Solubility, Pollutant identification, Chemical properties, Administrative agencies, Federal government, Inorganic compounds, Nitrates, Sodium compounds, Ions, Ionization, Statistics, Synoptic analysis, Chemical industry, Chemical reactions, Pesticides, Regulation, *Hazardous substances(Pollution), *Environmental Protection Agency, Federal Water Pollution Control Act Amendments of 1972.

The Environmental Protection Agency (EPA) has compiled documents relating to chemicals proposed as hazardous substances under Section 311 of the Federal Water Pollution Control Act of 1972. These chemical profiles represent the bulk of the data utilized in determining which substances were placed on the initial listing of substances. Each profile, dealing with a substance as a unique compound or parent ion of various salt forms, contains physical, chemical, and toxicological data as well as information concerning the substance's

waters, Sovereign immunity, Tankers, Supertankers, Liability, Certification.

After tracing United States legislative efforts to control marine pollution and briefly examining Egyptian law including Law No. 93, discussion focuses on international attempts to control marine pollution and emphasizes oil pollution. The 1973 International Conference on Marine Pollution, for example, adopted an extensive, but exception ridden, convention which applied to all types of ships and vessels, required inspection of each ship before issuance of an Oil Pollution Certificate, and imposed responsibility for the ship's operation on the issuing government. In both the United States and Egypt, tort law makes a shipowner liable for the acts of the master and crew either as a wrongdoer, an employer, or a guardian. The 1969 International Convention on Civil Liability for Oil Pollution imposes strict liability on shipowners for damage caused by oil escape or discharge from their vessels. This convention limits the amount of recovery, however, and contains several exceptions to strict liability itself. The author concludes that the numerous national and international controls are insufficient to cope with a rapidly growing problem. Only a uniform law of the sea accepted by all coastal states will permit uniform pollution control and enforcement. (Moorhouse-Florida) W78-02101

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER. Stanford Univ., CA. Dept. of Civil Engineering. For primary bibliographic entry see Field 6G. W78-02102

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPAL WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM. Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials. Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 145, Price codes: A99 in paper copy, A01 in microfiche. 1976. 1,299 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Planning, *Waste water treatment, *Cost sharing, Federal government, Regulation, Sewage treatment, Waste water disposal, Treatment facilities, Administrative agencies, Federal budget, Financing, Cities, Local governments, Research priorities, Zoning, Sewers, Separated sewers, Public hearings, Effluent guidelines, Land use controls.

Hearings were held in Atlanta, Kansas City, San Francisco, and Washington, D.C., to obtain comments from local waste water treatment officials regarding problems with the Federal Water Pollution Control Act. Officials discussed federal funding of local waste water systems and addressed funding priorities of governmental units faced with choices between crime control and water treatment programs. Complaints were heard from local residents regarding high sewer charges necessary to fund treatment systems. Zoning regulations, joint federal-local efforts and the ratios of joint funding, characteristics of projects funded, and the merits of funding storm sewers as well as sanitary sewers were considered by various speakers. Officials proposed increased efforts in research and development, more stringent or relaxed quality standards, revisions in bonding procedures, deviations in compliance from established standards, private waste disposal operations, extension of deadlines and surveys of needed projects. No conclusions or consensus of recommendations were reached, as only the comments were transcribed for publication. (Molloy-Florida)

and promote coordination in eight counties on both sides of the Kansas-Missouri border comprising the Kansas City watershed. These approaches include retaining the presently decentralized pattern of management agencies, seeking a centralized operational entity, creating county based agencies, creating watershed based agencies, and some combination of county and watershed based agencies. Local governments are most likely to accept the consolidation of county watershed agency. In the Kansas City area this could result in a reduction of operational agencies from 160 to 6. (Spector-Florida) W78-02096

WATER USES AND MISUSES: A WORLD VIEW. Resources for the Future, Inc., Washington, DC. For primary bibliographic entry see Field 6B. W78-02097

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS). P. J. Bernstein. The Nation, Vol. 224, No. 3, p 73-77, January 22, 1977.

Descriptors: *Oil industry, *Oil spills, *Oil pollution, *Ships, *Coast Guard regulations, Oily water, Continental shelf, Coasts, Federal jurisdiction, Exploration, Atlantic Ocean, Gulf of Mexico, Oil, Recreation, Transportation, Hazards, Wastes, Water quality, Wetlands, Water users, Water pollution, Design standards, Safety, Offshore platforms, *Tankers, *Supertankers, *Vessels, Coastal waters, Deep-water ports, Outer continental shelf.

Oil tanker spills threaten incalculable damage to the coastal environment. Safety regulations which govern the construction and operation of foreign and domestic oil tankers are needed. However, there is a common practice among firms owning oil tankers of registering their ships in foreign countries which do not impose standards for construction or operation similar to those imposed in America. The federal Ports and Waterways Safety Act of 1972 gave the Coast Guard the authority to issue rules and regulations designed to minimize shipping hazards, including dangers to the coastal environment. So far, the Coast Guard has only formulated rules for American vessels in domestic trade. It has yet to formulate rules covering foreign ships or American ships in foreign trade. The author discusses the Coast Guard's consideration of the regulations concluding that the Coast Guard was biased in favor of the oil shipping industry and that the regulations are inadequate. The author also advocates a program of federal exploratory drilling in the continental shelf area before the sale of oil-production rights. He points out that Puerto Rican statehood could ensure American control of that island's offshore oil. (Wright-Florida) W78-02099

MARINE POLLUTION AND THE ABSOLUTE CIVIL LIABILITY OF THE SHIPOWNER UNDER THE LAWS OF THE UNITED STATES AND EGYPT. Howard Univ. School of Law, Washington, DC. A. N. Roushdy. The Journal of International Law and Economics, Vol 10, No 1, p 117-82 (1975).

Descriptors: *International law, *Oil spills, *Water pollution control, *Law of the Sea, International commissions, Legal aspects, Foreign waters, International waters, Treaties, Oil industry, Federal government, Judicial decisions, Penalties(Legal), Law enforcement, Water law, Oceans, Navigation, Ships, Water pollution sources, Rivers and Harbors Act, Transportation, *Territorial seas(Jurisdiction), *Egypt, *Absolute liability, *International conventions, Coastal

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manufacture, handling, and shipment. Since the sole purpose of assembling the data was to provide a technical basis to meet the regulation requirements under Section 311, the data should not be viewed as valid for alternative uses. The EPA does not represent the data as final and complete. An extensive bibliography on toxic substances and their environmental effects is included. (Moorhouse-Florida)
W78-02106

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION (4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972).
Environmental Protection Agency, Washington, DC. Water Quality Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 145. Price codes: A99 in paper copy, A01 in microfiche. September 21, 1972. 625 p.

Descriptors: *Governmental interrelations, *Lake Michigan, *Standards, *Water pollution control, Agricultural runoff, Federal government, Illinois, Indiana, Law enforcement, Michigan, Pesticides, Phosphorus compounds, Regional analysis, River basins, State governments, Streams, Surveys, Thermal pollution, Water law, Water pollution, Water treatment, Regulation, Wisconsin, *Administrative regulations, *Environmental Protection Agency, Effluent limitations, Interstate waters, State policy.

The Environmental Protection Agency held a conference to discuss the current problems faced by state and federal agencies charged with the duty of protecting Lake Michigan from the deleterious effects of the various types of pollution. One major topic of the conference was a review of the status of compliance by the various pollution dischargers with the recommendations of previous conferences. These recommendations included adequate treatment, 80 percent total phosphorus removal from municipal waste, industrial waste control, and elimination of pollution from combined sewer systems. Tables are included showing the status of compliance with enforcement conference requirements of sources in those states bordering Lake Michigan. The representatives from each agency detailed their enforcement efforts and results in an attempt to coordinate the Lake Michigan policy as a whole. In addition, testimony was received from experts as to the effectiveness of previous conference decisions and standards, and on the advisability of changing those standards or continuing them. (Jordan-Florida)
W78-02108

RELLA V. BERLE (STANDARDS FOR APPROVING WELL APPLICATION FOR DEVELOPMENT OF PUBLIC WATER SUPPLY).
For primary bibliographic entry see Field 6E.
W78-02109

UNITED STATES STEEL CORP. V. TRAIN (EFFLUENT LIMITATIONS ON NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
For primary bibliographic entry see Field 6E.
W78-02114

RYAN V. COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES (FORMER LESSEE REQUIRED TO ABATE NUISANCE CREATED DURING TENANCY).
For primary bibliographic entry see Field 6E.
W78-02115

COASTAL FACILITIES REVIEW ACT.
For primary bibliographic entry see Field 6E.

W78-02117

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-02120

FLOATING BOOM.
Cascade Industries, Inc., Edison, NJ. (Assignee).
R. E. West.
U.S. Patent No. 4,030,304, 6 p, 6 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 996, June 21, 1977.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Water pollution treatment, Floating, Equipment, Deflection, Booms, Containment.

A floating boom designed to confine oil or other floating pollutants is adapted to be connected in end to end relationship and to fold in accordion style when not in use. The end-connecting hinges are secured to the end edges of an elongate, generally rectangular flexible skirt which is formed from a liquid-impervious plastic material. Secured to the upper edge portion of the skirt are pairs of floats. Each float comprising identical but oppositely arranged sections are secured to opposite faces of the skirt. The sections, when so secured, impart to each float a cross-sectional configuration which may be appropriately described as comprising bulbous lower portion merging into recessed midportions which in turn merge into bulbous upper portions smaller in cross-sectional size than the lower portions. The recesses, thus, extend continuously along the length of each float, and are so designed as to serve as wave deflectors adapted to receive waves or wavelets, and turn them back into the area about which the boom extends. (Sinha-OEIS)
W78-02125

COMBINED LEACHING AND SUMP CATCH-BASIN.
R. M. Hicks.
U.S. Patent No. 4,031,009, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1229, June 21, 1977.

Descriptors: *Patents, *Runoff, *Storm runoff, *Surface runoff, *Drainage systems, Urban drainage, *Leaching, Water quality control, Catch-basins.

A pre-cast reinforced concrete catch-basin of larger than conventional size includes a solid horizontal bottom wall with solid, hollow, cylindrical side walls standing up to about half the height of the catch-basin. The lower half thus forms a sealed, unapertured, undrained, sump receptacle for collecting drain water and silt and allowing sand to settle out. The hollow, cylindrical, upper half contains leaching openings which extend through from the inside to the outside of the wall, from top to bottom, for discharging cleared water to the surrounding, stone-lined earth without plugging, or clogging, and without polluting nearby wells, brooks, etc. (Sinha-OEIS)
W78-02131

CRYOTHERMAL MANIPULATION OF PETROLEUM SPILLS ON WATER.
S. L. Ross, and O. Shuffman.
U.S. Patent No. 4,031,707, 9 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1465-1466, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water pollution control, *Cryogenics, Freezing, Equipment.

The invention relates to a method and apparatus for controlling or manipulating a body of crude, refined, or used petroleum such as in the herding and recovery of an oil spill in a body of water. It can also be used in temporarily stopping a leak in an oil tanker caused by a cracked hull, in recovering oil inadvertently spilled on a beach front, in plugging an oil casing pipe to control an oil fire at sea on a drilling platform, in effecting preliminary refinement of oil at the oil rig site, in transporting oil from the Arctic or Antarctic region without resorting to complicated and costly apparatus, and in many other applications. The method basically comprises exposing the petroleum mass either to a transient atmosphere or environment of a freezing, sub-freezing, or cryogenics temperature, or contracting the petroleum with a substance or mechanism exhibiting freezing, sub-freezing, or cryogenics temperatures. The apparatus comprises mechanisms for handling substances at freezing, sub-freezing or cryogenics temperatures and capable of maintaining the material in the vicinity of the petroleum mass. The reaction of petroleum to cryogenics temperatures causes the petroleum mass to move or to pull in or contract very rapidly. The reaction of petroleum is to move very sharply and very quickly away from the lower temperature and at the same increase its surface tension. Because of the development of the surface tension and the very orderly arrangement of the molecules of the petroleum mass, as opposed to the amorphous disposition, the petroleum literally squeezes out any foreign matter. (Sinha-OEIS)
W78-02132

SKIMMER FOR A BODY OF LIQUID WITH FLOATING SOLIDS.
Societe Anonyme Texaco Belgium N.V., Brussels. (Assignee).
E. V. M. De Visser, and K. I. Ghyselen.
U.S. Patent No. 4,032,449, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1708, June 28, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Skimming, Solid wastes, Suspended solids, Waste disposal, Equipment.

The object of this invention is to provide an improved skimmer that includes an apparatus for effectively breaking up lump-forming solid matter that is floating on the surface being skimmed. The skimmer for use on a body of water having solid matter floating on the surface comprises in combination weir means for drawing off liquid from the surface and means for adjustably supporting the weir vertically relative to the surface. It also comprises tooth means for beaking up solids having greater than a predetermined size and tending to be carried over the weir when the water is drawn off. (Sinha-OEIS)
W78-02137

OIL-WATER SEPARATOR.
V. S. Pedone.
U.S. Patent No. 4,032,453, 6 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1709-1710, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution control, Pollution abatement, Filtrations, Resins, Bilge water, Hydrophobic conditions, Oleophilic conditions.

The water and oil that is normally collected in the bilge of small boats is pumped overboard by a bilge pump with the oil being removed from the bilge water by a filter having layers of different size expanded resin particles that are hydrophobic and oleophilic. When operation of the bilge pump ceases, a valve will release the back pressure that would otherwise be caused by the filter, to facilitate start-up of the pump. At the discharge and visible on the exterior of the boat, there is an indicator that will change color when it is in con-

tact with oil, to provide a visual indication when the filter needs changing. (Sinha - OEIS) W78-02139

METHOD AND APPARATUS FOR ULTRASONICALLY REMOVING CONTAMINANTS FROM WATER.

Ocean Ecology Ltd., Edmonton (Alberta). (Assignee). J. N. Koblanski.

U.S. Patent No. 4,032,438, 6 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1704, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, *Water pollution treatment, Water quality control, *Ultrasonics, Sound waves, Equipment.

An apparatus employing an ultrasonic focusing transducer is provided for removing a contaminant such as oil which is floating on the surface of a body of water. The transducer is supported beneath the water surface with its focal region aimed at the underside of the contaminant oil. A source of alternating current is connected to the transducer to generate ultrasonic waves which travel through the water and converge at the focal region. The apparatus includes a collecting arrangement which catches most of the oil bounced upwardly as the result of the focused ultrasonic waves before that upward discharged oil can fall back onto the water surface. (Sinha - OEIS) W78-02141

OIL SPILL CONFINING AND DIRECTING APPARATUS AND METHOD USING WATER SPRAY BOOMS.

Marine Construction and Design Co., Seattle, WA. (Assignee). J. L. McGrew.

U.S. Patent No. 4,033,869, 8 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water quality control, Skimming, Sprays, Spraying, Booms, Equipment, Oil spill recovery.

The object of the invention is to devise an improved non-submersion type boom or similar oil spill confining, sweeping or directing apparatus and method. It has been found that the requisite fluid flow forces effective as a sweep curtain to confine and sweep an oil spill may be created by use of water, and more specifically by forming sprays of water sufficient in velocity and volume to entrain air inductively with the water droplets, sufficiently large by their momentum effect to have the requisite carrying effect over the varying distances to wave crests and troughs, yet sufficiently small in droplet size and impact effect on the oil spill that the oil is not dispersed or emulsified by the spray. Furthermore, by providing a series of successively spaced water spray nozzles along support booms, preferably in the form of water headers or conduits supplying the pressure nozzles, overlapping spray patterns are formed with the effect of a continuous uninterrupted curtain of fluid impacting the water's surface. With such booms divergently positioned ahead of and at opposite sides of an oil spill recovery vessel, oil is confined and directed into the path of advance of the recovery vessel from a wide swath with minimum expenditure of energy, i.e. merely the pumping of water through the nozzle system. With sprays of relatively thin and wide configuration overlapping each other at or before impact with the water's surface gaps in the lines or zones of coverage are avoided through which oil would otherwise escape. (Sinha-OEIS) W78-02150

SPILLED OIL RETRIEVER AND ANTI-WATER POLLUTION WATER CRAFT.

D. L. Cocjin, and A. M. Masongsong. U.S. Patent No. 4,033,876, 5 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 308, July 5, 1977.

Descriptors: *Patents, *Water quality control, *Oil pollution, *Oil spills, *Water pollution treatment, Boats, Skimming.

A watercraft which is capable of gathering spilled oil or liquids lighter than water which pose as a health hazard to people and marine life is described. The water craft has a pointed bow and incorporates curved pivotable gates to partially for the bow along with an underwater scoop. The scoop has a horizontal surface beneath the water. The gates open to permit water and oil to move onto that surface and upward over an inclined surface leading to a horizontal trough amidships above the water craft. The trough opens for gravity deposit of the oil and water into a water and oil separating tank within the rear of the water craft hull. (Sinha-OEIS) W78-02153

APPARATUS FOR SEPARATING OIL AND WATER.

M. Seo, and Y. Seo. U.S. Patent No. 4,035,302, 5 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 782, July 12, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Separation techniques, *Water treatment, Water pollution control, Water pollution treatment, Equipment, Filtration, Water quality control.

An apparatus for separating oil and water comprises a pipe coiled annularly along the inner surface of the upper portion of a treating chamber and contains a large number of small diameter members arranged parallel to one another. The pipe is connected at its lower end to an inlet for an oil and water liquid mixture. The pipe is open at its upper end to form a rough separating section having an upper oil accumulating portion with an oil discharge pipe. A distribution layer is mounted below the rough separating section to form a flow distribution section for passage of a roughly separated water. A filter tube having a wall composed of a filter layer comprising a mixture of lipophilic fibers and hydrophilic fibers is mounted in the lower portion of the treating chamber to form a fine separating section having an oil accumulating portion at the top with an oil discharge pipe and a separated water discharge pipe at the bottom. (Sinha-OEIS) W78-02166

SCOPE OF RESEARCH NEEDS,

Environmental Protection Agency, Denver, CO.

A. W. Dybdahl.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 35-36.

Descriptors: *Pollution abatement, *Remote sensing, Water pollution control, Air pollution, Regulation, Legal aspects, Enforcement.

Remote sensing needs are identified by the Office of Enforcement and General Counsel (OEGC) of the National Field Investigations Center (NFIC), EPA. These are: (1) interdisciplinary coordination to better define tasks related to the dilution of air and water pollutants; (2) remote sensing keys for each class of industrial and municipal facilities and discharges, consisting of a catalogue of facility and discharge characteristics; (3) airborne detec-

tion systems which operate a round the clock for the enforcement program; (4) identification and quantification of all types of pollutants; (5) analysis of the nonlinear optical properties of wastewater for pollutant fingerprinting; (6) a detection system for oil or grease emulsified water; (7) a real-time airborne air quality monitoring system; (8) pooling together of all remote sensing techniques; and (9) much better access to Earth Resources Technology Satellite (ERTS) digital tapes and transparencies at the NASA Goddard Space Center. (Lynch-Wisconsin) W78-02172

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS.

Environmental Protection Agency, Seattle, WA. Region X.

R. B. Bauer.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 32-34.

Descriptors: *Pacific Coast Region, *Water pollution control, *Water pollution sources, Remote sensing, Eutrophication, Nutrients, Alaska, Oregon, Rivers, Willamette River(OR), Nonpoint pollution, Snake River.

EPA's Region X (Pacific Northwest) generally has clean air and an abundance of high quality water. Point source pollution should be reasonably well controlled within the next five years. A notable success is the virtually complete control of liquid waste discharges in the Willamette River (OR). However, nonpoint pollution sources are a significant problem; for example, only 32% of the phosphorus loading in the Upper Snake River can be accounted for by point sources. Because the Region covers 845,000 sq mi, remote sensing holds great potential for monitoring environmental problems. These problems include fugitive dust from unpaved roads and agricultural activities, urban runoff, stream sedimentation and thermal pollution due to logging, particulates from slash burning, leaching from solid waste dumps, irrigation return flows, animal feeding operations, drainage from abandoned mines, eutrophication, oil spills, and accidental radioactivity releases. The greatest drawbacks of aerial imagery are the inability: to quantify concentrations of chemical toxicants and nutrients; to correlate concentration with depth, and to penetrate cloud cover. (Lynch-Wisconsin) W78-02176

REMARKS, REGION VIII,

Environmental Protection Agency, Denver, CO. Region VIII.

For primary bibliographic entry see Field 5A.

W78-02179

BIOLOGICAL INTEGRITY—1975,

Brookhaven National Lab., Upton, NY. Dept. of Biology.

For primary bibliographic entry see Field 6G.

W78-02184

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SUBSTITUTION AND THE CONTROL OF POLLUTION.

State Univ. of New York at Albany. Dept. of Economics.

For primary bibliographic entry see Field 5G.

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

W78-02011

6B. Evaluation Process

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT),
Systems International, Inc., Gambrells, MD.
For primary bibliographic entry see Field 7B.
W78-01739

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5G.
W78-01770

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA,
Horan, Lloyd, Dennis, and Farr, Carmel, CA.
For primary bibliographic entry see Field 2L.
W78-01810

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 2L.
W78-01816

ORGANIZATION ARRANGEMENTS FOR MANAGEMENT OF ATLANTIC COAST ESTUARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-01817

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT,
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
J. P. Merchant, and D. M. Dornbusch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 241.
Price codes: A09 in paper copy, A01 in microfiche.
Completion Report, 1977. 168 p, 16 fig, 28 tab, 210 ref, 2 append. OWR T C-7042(No. 6205)(1), 14-34-0001-6205.

Descriptors: *Water rights, *Indian reservations, Feder reservations, Public lands, South Dakota, North Dakota, *Model studies, *Water supply, Legal aspects, Economic impact, *Rosebud Sioux Reservation(South Dakota), *Fort Berthold Reservation(North Dakota), *Water law, *Linear programming, *Economic development.

The importance of water supply to economic development was analyzed for the Fort Berthold (North Dakota) and Rosebud Sioux (South Dakota) Reservations. A linear programming model was developed for each Reservation's economy to determine the importance of water as a factor of production. Marginal productivity curves for water were constructed by varying the water supply assumed to be available to each Reservation. Full development of Fort Berthold's potential coal and agricultural resources would consume 240 thousand acre-feet per year, less than the available supply. Development of the Rosebud Sioux agricultural resources would be limited by available water supplies of 266 thousand acre-feet per year. Marginal value added for an acre-foot of water ranged from \$0 to \$325 on the Fort Berthold Reservation and from \$175 to \$400 on the Rosebud Sioux Reservation. Both Reservations face substantial legal barriers to the full use of available water supplies. Should the Fort

Berthold and Rosebud Sioux Reservations lose key legal contests, the resulting water shortage could limit the value added to their economies to 74 percent and 50 percent of their respective full potentials. Other factors which impede full development of Reservation resources include lack of financing, jurisdictional uncertainties, land ownership patterns, and a shortage of managerial and labor skills. The study offers guidelines for asserting water rights and for ameliorating some of the conditions inhibiting development.
W78-01821

RECREATIONAL BOATING IN DADE COUNTY 1975-76,
Miami Univ., Coral Gables, FL.
C. B. Austin, R. Brugger, J. C. Davis, and L. Siefert.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 032.
Price codes: A08 in paper copy, A01 in microfiche.
Miami University Sp. Sea Grant Report No. 9.
March 1977. 143 p, 25 fig, 57 tab, 12 ref, 2 append.

Descriptors: *Florida, *Boating, *Recreation demand, Fishing, Marinas, Boats, Recreation facilities, Recreation, Surveys, Baseline studies, Benefits, Water sports, Water pollution sources.
Identifiers: Dade County(FL).

A comprehensive profile of recreational boating in Dade County, Florida, in 1975-76 is based on: (1) boat registrations, (2) census data, (3) original data taken from in-situ surveys of berthed boats, (4) aerial counts of offshore boats, (5) telephone interviews with all marina operators, (6) 4,275 interviews with owners of trailerable and wet-berthed boats, (7) a random 'creel census' of fish catches, and (7) 1,104 questionnaires returned by boat owners. Of 346,353 boats registered in Florida, Dade County possesses the most, 35,923 or about 10%; per capita ownership is lower than in some rural counties, however. Five waterfront recreational boating sites are operated by the county. Compared with average Dade County residents, boat owners tend to be older (44 vs. 34 years), have been county residents longer, are more apt to live in single-family homes (84% vs. 42%), and earn higher incomes (57% vs. 13% have incomes over \$20,000). About 20% of registered boaters (7,000-8,000) are responsible for most of the active boating recorded at county and commercial marinas, with a boat use of about three times per month. Some 70% of recreational boating is done by trailerable boat owners, and larger (16-25 ft) trailerable boats are growing in popularity. Berthed boat owners expressed most concern about security, while trailerable boat owners were interested in more parking space and an increase in the number of longer launching ramps. (Lynch-Wisconsin)
W78-01889

ASSESSING THE RECREATION POTENTIAL OF RIVERS,
Michigan State Univ., East Lansing. Dept. of Geography.
M. Chubb, and E. H. Bauman.
Journal of Soil and Water Conservation, Vol. 32, No. 2, p 97-102, March-April 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Recreation, *Model studies, *Rivers, Michigan, Evaluations, *National Forest Recreation Survey, Pine River(MI), Manistee River(MI), Looking Glass River(MI).

A computer method is outlined for assessing reaction potential of rivers by evaluating environments for 16 different recreational activities. The method involves analysis of a range of pertinent natural and cultural variables and is applicable to rivers of all types from slow moving streams in urban areas to torrents in wilderness locations. And it permits comparisons between rivers of various types or between segments of the same river or different

rivers. Four steps are involved. There is an initial inventory of variables, treating each river mile as a separate unit. The second step is to 'float' the river, checking information obtained from aerial photos or agencies for each river segment. The third step weighs values to reflect relative importance in determining feasibility of a particular activity. In the final step the computer program sums the weighted scores for each variable and expresses the total as a percentage of the maximum possible. The method was tested on three Michigan rivers, the Pine, the Manistee and the Looking Glass River. The approach is described as sound. The scoring system outlined worked well in the field, although it was possibly weak in some areas. (Coyle-Wisconsin)
W78-01910

ON THE TAXATION OF NONREPLENISHABLE NATURAL RESOURCES,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-02008

THE USE OF SITE SURVEYS IN THE COLLECTION OF RECREATION DATA, WITH PARTICULAR REFERENCE TO THE CONGLETON DISTRICT OF CHESHIRE,
Crewe and Alsager Coll., Alsager (England). Environmental Studies.

C. Chave, C. Fairhurst, and M. P. Thomas.
International Journal of Environmental Studies, Vol 10, No 4, p. 245-251, 1977. 1 fig, 10 tab, 3 ref.

Descriptors: *Data collection, *Recreation, *Surveys, Recreation demand, Recreation facilities, Attitudes, Sites, Scenery, Tourism.
Identifiers: England, Cheshire(England), Congleton District(England).

Site surveys were conducted at five recreation spots in the Congleton District of Cheshire (England) to collect data for management and planning use. The sites were: The Cloud, a scenic hill area with paths and views of the Cheshire Mow Cop and Congleton Edge, with moorland walks and scenic views; Shakerley Mere, a sand pit now containing a fishing and boating pond; and Sandbach Flashes, a group of salt subsidence lakes of ornithological interest. All surveys were carried out in June and July 1974 on Sunday afternoons, and visitors were asked 12 questions regarding length of trip, number and ages in party, means of transportation, occupation, reasons for coming, and how crowded they thought the site was. A total of 395 interviews were conducted, ranging from 21 at Sandbach Flashes to 124 at Shakerley Mere. The most important reason given for choice of site was that people simply 'liked what they knew' and returned often to familiar sites. Other important reasons were walking, scenery, quiet, the houses (at Moreton Hall and Congleton Edge), and wildlife (Sandbach Flashes). Nonmanual workers dominated at all sites (68-95%); groups with children were dominant at three sites, while at two it was evenly divided. Most respondents did not consider the sites crowded. The average distance travelled was 21.7 km. (Lynch-Wisconsin)
W78-02012

THE RECREATION BENEFITS OF WATER QUALITY IMPROVEMENTS: ANALYSIS OF DAY TRIPS IN AN URBAN SETTING,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
C. S. Binkley, and M. W. Hanemann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 719.
Price codes: A12 in paper copy, A01 in microfiche.
Final Report to EPA, June 1976. 251 p, 3 fig, 42 tab, 45 ref, 4 append. EPA-68-01-2281.

Descriptors: *Recreation demand, *Water quality standards, *Beaches, Model studies, Surveys, De-

mand, Massachusetts, Swimming, Social aspects, Regression analysis, Recreation, Decision making. Identifiers: *Boston(MA), Willingness to pay, Water quality improvements, Water quality indices, Opinion analysis.

A questionnaire survey of 467 households in the Boston area was conducted in December 1974 to assess the influence of beach water quality improvements on recreation demand. Conclusions reached were: (1) perceived water quality is not related to actual water quality; beach reputation for water quality is more important as a determinant than actual water quality; (2) proximity, beach cleanliness, setting, and facilities are more important determinants of beach choice than water quality; (3) despite the insensitivity of recreation demand to water quality, respondents were willing to pay \$20-26 per family per year for improved water quality, indicating that attempts to quantify benefits of improvements on the basis of consumption are misguided; water quality appears to be a highly valued good merit; (4) people are willing to pay more to maintain existing water quality as sites with high water quality than at sites with poorer water quality. Twenty-nine fresh and salt water beaches within 50 miles of Boston were sampled for 13 water quality parameters, and a beach quality catalogue was compiled. Statistical analysis of sampling and questionnaire data included tabulation, factor analysis of water quality parameters to develop water quality indices, correlation analysis between perceived and actual water quality, multiple regression analysis to estimate determinants of willingness to pay and recreation behavior, and specification and estimation of two multi-site models. (Lynch-Wisconsin) W78-02016

WATER USES AND MISUSES: A WORLD VIEW.

Resources for the Future, Inc., Washington, DC. K. D. Frederick. Resources, No. 55, (Resources for the Future), p. 1-5, April-June, 1977.

Descriptors: *Water allocation(Policy), *Water distribution(Applied), *Water utilization, *Water management(Applied), Irrigated land, Water resources, Water shortage, Water demand, Surface waters, Water conveyance, Water users, Groundwater resources, Water resources development, Water supply, Water pollution, Water rights, Surface water availability, Environmental effects, Water quality, Waste disposal, Inter-basin transfers, *Federal Water Pollution Control Act Amendments of 1972, Aswan Dam, Property interests, United Nations Water Conference.

As the demand for water increases, the problems associated with limited natural water resources become more apparent. This article explores the numerous problems that occur when water supplies are used excessively or abused. Water management institutions usually fail in their objectives to use water efficiently because water is a common property resource accessible to many while belonging to no one. Governmental agencies have shown their inability to evaluate benefits and costs associated with alternative water uses. The United States is used as an example of short-sighted water management. Water quality has been impaired in the East through the use of water for waste disposal. The absence of water conservation in the West has resulted in an increasing scarcity of water. The demands on the Colorado River threaten not only the quality of the water in the downstream areas but even the very existence of the river. The High Plains region is dependent on a declining and essentially non-renewable supply of groundwater. The expensive solution of interbasin water transfers is still being considered for this region. The author urges developing nations to profit from the United States' poor example. (Quarles-Florida) W78-02097

HAZARDOUS WASTES: A RISK-BENEFIT FRAMEWORK APPLIED TO CADMIUM AND ASBESTOS.

Stanford Research Inst. Menlo Park, CA. K. D. Moll, S. Baum, E. Capener, F. W. Dresch, and R. M. Wright.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 951. Price codes: A12 in paper copy, A01 in microfiche. SRI Report No EGU-3561, September 1975. 26 fig, 16 tab, 92 ref. Report to EPA, Washington, D.C., Office of Research and Development. EPA 68-01-2915.

Descriptors: *Methodology, *Cadmium, *Asbestos, *Waste disposal, *Decision making, Economics, Pollutants, Wastes, Systems analysis, Environmental effects, Toxicity, Feasibility studies, Cost-benefit analysis, Model studies, Evaluations, Methodology, Risk-benefit analysis.

A multidisciplinary analysis was used to develop a decision-making framework for evaluating hazardous waste disposal standards in terms of social risks and product benefits. Risk-benefit analysis was considered most appropriate in assessing environmental effects of various dose levels of hazardous materials. The framework was applied to cadmium and asbestos case studies. The advocated approach begins with examination of existing standards and contamination sources to provide a base of comparison with alternative controls. The data are subjected to economic analysis, and human exposures are related to health effects. To determine feasibility, alternate controls are compared with one another and with other decision considerations; feasible alternatives are further analyzed to select the best overall approach. The case studies involved two sample controls for cadmium (a zinc smelter scrubber and scrubbers on municipal incinerators) and two for asbestos (asbestos manufacturing exhaust filters and asbestos substitutes in automobile brakes). All four showed severe cost-effectiveness deficiencies. (factors of 10 - 1,000 below desired efficiencies). Several types of data refinement are needed for further application of the methodology, such as reasonable threshold dose estimates, physiological responses to high and low dose levels, and long-term and ecological effects. (Lynch-Wisconsin) W78-02182

THE EFFICIENCY AND EQUITY OF COST ALLOCATION METHODS FOR MULTIPURPOSE WATER PROJECTS.

Central Connecticut State Coll., New Britain. Dept. of Economics. For primary bibliographic entry see Field 6C. W78-02186

BENEFITS OF FLOODWATER MANAGEMENT IN THE CLOSED DEVILS LAKE BASIN.

For primary bibliographic entry see Field 4A. W78-02191

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ON THE TAXATION OF NONREPLENISHABLE NATURAL RESOURCES.

Kentucky Univ., Lexington. Dept. of Economics. H. S. Burness. Journal of Environmental Economics and Management, Vol. 3, No. 4, p. 289-311, 1976. 17 ref.

Descriptors: *Taxes, *Mathematical models, *Natural resources, Fixed costs, Costs, Resource allocation, Economics, Optimization, Social aspects. Identifiers: Severance tax, Subsidies.

Effects of various tax-subsidy policies on producers of natural resources and on the composite industry are assessed. Nonreplenishability is assumed, in order to reduce the problems associated with intertemporal dynamics to a minimum. A limiting assumption of this and earlier analyses is that fixed costs must be avoidable through the ultimate termination of the production process. Both the competitive and monopolistic cases are considered. Taxes may be devised to generate private sector optimal production and depletion rates which are identical to socially optimal rates. In terms of policy, in the absence of free entry no single tax will ordinarily suffice; a combination of tax (subsidy) instruments is necessary. A complete taxonomy of the effects of various taxes or subsidies is presented. Imposition of a severance tax on coal is seen to result in no change in output as long as firms are earning economic rents. Hence, the entire burden of the tax falls on the coal producer, not shifted to the consumer as has been argued by proponents of coal severance taxes. In the case of restricted entry, a tax-subsidy optimizing behavior consists of a franchise tax (subsidy) and a severance tax (subsidy). For free entry, a single ad-valorem or per-unit severance tax ensures the same outcome. (Lynch-Wisconsin) W78-02008

SUBSTITUTION AND THE CONTROL OF POLLUTION.

State Univ. of New York at Albany. Dept. of Economics. For primary bibliographic entry see Field 5G. W78-02011

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.

Reading, PA. USAC Project. For primary bibliographic entry see Field 3E. W78-02181

THE EFFICIENCY AND EQUITY OF COST ALLOCATION METHODS FOR MULTIPURPOSE WATER PROJECTS.

Central Connecticut State Coll., New Britain. Dept. of Economics. J. C. Loughlin. Water Resources Research, Vol 13, No 1, February 1977, p. 8-14. 4 tab, 26 ref.

Descriptors: *Cost sharing, *Cost allocation, *Cost benefit ratio, *Separable costs, *Specific costs, *Economic efficiency, Joint costs, Equity, Evaluation, *Alternative justifiable expenditure, *Use of facilities method (Cost allocation), Water resource program, Separable costs-remaining benefits(SCRB), Marginal cost pricing, Justifiable costs.

A three-way review of separable costs-remaining benefits (SCRB), alternative justifiable expenditure and use of facilities methods of cost allocation on federal water resource programs, concludes that only SCRB satisfies all three economic efficiency requirements. From the equity standpoint, however, all three methods fall short of acceptable measures. None of the three assigns to a project purpose a proportional share of the savings resulting from a multiple purpose development. For the SCRB and alternative justifiable expenditure methods, a simple adjustment is proposed to produce the same result. Because of difficulty in defining reservoir use, no adjustment to that method will result in cost allocation equity. The proposed SCRB adjustment applies to the cost allocation procedure, producing a method which meets both efficiency and equity criteria. The adjustment assigns a credit to separable costs in the same ratio as justifiable costs for a project purpose, plus justifiable costs for all other purposes to the total project cost. The result is a tendency for savings assigned to each purpose to relate proportionally to savings from including each purpose in a project. (Coyle-Wisconsin)

Field 6—WATER RESOURCES PLANNING

Group 6D—Water Demand

W78-02186

6D. Water Demand

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT.
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 6B.
W78-01821

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA.
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01859

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975.
Geological Survey, Tacoma, WA. Water Resources Div.
N. P. Dion, and W. E. Lum, II.
Open-file report 77-308, 1977. 34 p, 7 fig, 10 tab, 3 ref.

Descriptors: *Water supply, *Water consumption (Except consumptive use), *Surface waters, *Groundwater, *Washington, Municipal water, Industrial water, Irrigation water, Freshwater, Saline water, Water users, Water utilization, Evaluation.

An assessment of water use in 1975 in the 39 counties and 62 Water Resources Inventory Areas of Washington, indicated that 2.49 trillion gallons of water was used for municipal, industrial, and irrigation purposes. That amount represents a 10-percent increase over a similar water-use assessment in 1965, but a slight decrease from that of 1970. Total municipal water use, which includes municipally supplied industrial water, was 283 billion gallons. Industry used 442 billion gallons, of which 121 billion gallons was from municipal systems and 321 billion gallons was for self-supplied systems. Of the 604 billion gallons of water used for municipal and industrial supplies 145 billion gallons was ground water, 444 billion gallons was fresh surface water, and 14.8 billion gallons was saline surface water. A compilation of statewide industrial use as categorized by SIC (Lumber and Wood Products), SIC 28 (Chemicals and Allied Products), and SIC 20 (Food and Kindred Products)—accounted for about 65 percent of the total water used in industrial processes. In 1975, 5.79 million acre-feet of irrigation water (1,890 billion gallons) as applied to 1.52 million acres. This water was 95 percent surface water and 5 percent ground water. About 97 percent of the irrigation water was supplied in eastern Washington, to about 94 percent of the irrigated acreage in the State. (Woodard-USGS)
W78-01865

THE USE OF SITE SURVEYS IN THE COLLECTION OF RECREATION DATA, WITH PARTICULAR REFERENCE TO THE CONGLETON DISTRICT OF CHESHIRE.
Crewe and Alsager Coll., Alsager (England). Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-02012

6E. Water Law and Institutions

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.

For primary bibliographic entry see Field 5G.
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01717

CONTROLLING INDUSTRIAL WATER POLLUTION—PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).
Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-01718

RESPONSIBILITIES, ACTIVITIES AND AUTHORIZATIONS OF FEDERAL AGENCIES HAVING BEARING ON U.S. MARINE FISHERIES.
Coopers and Lybrand, Washington, DC.
J. M. Kirk.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 250. Price codes: A20 in paper copy, A01 in microfiche. Prepared for Gulf States Marine Fisheries Commission, 531 St. Louis Street, New Orleans, La. 70130. September, 1975. 292 p, 97 ref, 4 append. GSMFC-002.

Descriptors: *Marine fisheries, *Commercial fishing, *Marine fish, *Fisheries, Fish, Federal government, Fishing, Administrative agencies, Legislation, Fish conservation, Fish populations, Fish harvest, Sport fish, Budgeting, Decision making, Regulation, Recreation, Fish management, *Marine resources, Department of Commerce, Department of the Interior, Fisheries policy, Fishing industry.

In response to a 1973 Congressional resolution calling for a national fisheries policy, the Gulf States Marine Fisheries Commission contracted for a survey which was to provide the basis for certain recommendations to be made to Congress. The result is an inventory of all federal agencies having responsibilities which relate in any way to commercial or recreational marine fisheries. Included are discussions of the activities of the agencies surveyed; pertinent budget information; and the goals outlined in the National Marine Fisheries Service National Plan for Marine Fisheries, correlated with the chronological list of legislative authorities published by the Fisheries Service. It appears that there are some areas of overlapping responsibility among various agencies, and also some areas in which responsibility is not clearly or fully delineated. Agency annual reports and budget requests are synthesized as well as other public documents; the report also includes an extensive bibliography. (Sloan-Florida)
W78-01719

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES.
Public Administration Service, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-01720

LAWS AND REGULATIONS AFFECTING COAL WITH SUMMARIES OF FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS PERTAINING TO AIR AND WATER POLLUTION CONTROL, RECLAMATION, DILIGENCE AND HEALTH AND SAFETY.
Department of the Interior, Washington, DC. Office of Minerals Policy and Research Analysis.
For primary bibliographic entry see Field 5G.
W78-01721

GEOHERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT.
National Science Foundation, Washington, DC. Research Applied to National Needs.
C. D. Stone, and J. McNamara.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 592. Price codes: A13 in paper copy, A01 in microfiche. September 1975, 259 p, 5 tab.

Descriptors: *Regulation, *Public lands, *Geothermal studies, *Energy, Thermal conductivity, Planning, Federal government, Geophysics, Heat flow, Thermal properties, Heat, Water law, Legal aspects, Leases, Public rights, Regional development, Economics, Social aspects, Regional analysis, Land use, Electric power production, *Energy crisis, *Geothermal energy, *Alternate energy sources.

Although the federal government has the capacity to invoke a broad range of proprietary powers as 'owner' of fuel mineral resources, federal management has not been integrated into an overall national energy program. Geothermal energy, the energy latent in the heat of the earth's interior, is a potential source of electric power. However, its development is hampered by a number of factors including: (1) pre-leasing procedures, public vs. private assessment; (2) exploratory permits and related strategies; (3) the rate of geothermal leasing, past and future; (4) competitive and non-competitive bidding procedures; (5) lessee qualifications; (6) lands available for leasing; (7) non-compensatory lease terms; (8) ongoing leasehold and production requirements; (9) problems of secondary geothermal uses; and (10) water law conflicts. Confrontations are likely to arise between a geothermal developer and state water right holders, state engineers, and the federal government. A basic legal issue in geothermal development involves the extent of interconnection of geothermal fluid with the groundwater supply. Another issue hinges on the geothermal's place in a state water regulatory scheme. Resource ownership and federal water rights are additional potential areas for legal conflict. (Moorhouse-Florida)
W78-01724

POLLUTION OF NAVIGABLE WATERS OF THE DETROIT RIVER, LAKE ERIE AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN.
Public Health Service, Rockville, MD.
For primary bibliographic entry see Field 5G.
W78-01725

PROCEEDINGS OF JOINT MEETING OF FEDERAL AND STATE GOVERNMENTS ON MISSISSIPPI RIVER TEMPERATURE STANDARDS (2ND SESSION) HELD AT ST. LOUIS, MISSOURI ON MARCH 3, 1971.
Environmental Protection Agency, Office of Water Quality, Washington, D. C.
For primary bibliographic entry see Field 5G.
W78-01726

WATER FOR FOOD AND FIBER PRODUCTION.
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-01727

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS.
For primary bibliographic entry see Field 5G.
W78-01728

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION, Wyoming Univ., Laramie. Coll. of Law. F.J. Trelease.

Land and Water Law Review, Vol. 12, No. 2, p. 385-429, 1977.

Descriptors: *Legislation, *Water law, *Water management(Applied), *Water rights, *Local governments, Water pollution control, Legal aspects, Riparian rights, Water allocation(Policy), Water quality control, Water control, Water conservation, Water consumption(Except consumptive use), Water supply development, Law enforcement, State governments, Environmental control, Water utilization, *State policy, Licenses, Environmental policy, Property interests.

There are many problems faced by water lawyers in developing a water law system which will not only facilitate and achieve efficient allocation of resources and environmental protection, but also promote attainment of social and national goals. The author limits this discussion to the law of water rights with emphasis on aiding a draftsman in developing a modern water law system which promotes the welfare of water users, accomplishes the state's social and economic objectives, coordinates private activities with state projects, protects the interests of the public, and integrates the activities of individual and corporate users into comprehensive state plans for water development and management. Included are suggestions to aid draftsmen in approaching the task of writing water rights laws, in analyzing the problems which must be solved, in choosing solutions to those problems and in drafting the laws themselves. A detailed discussion of the major features and central principles applicable to every water law makes up the bulk of the article. Features examined are the scope of the law, initiation of rights, preservation of existing uses and the nature of the water right. (Howard-Florida) W78-01729

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT), Spessard L. Holland Law Center, Gainesville, FL. P. Baker.

Available from Eastern Water Law Center, University of Florida, Gainesville, 32611, \$3.10. Spring, 1977, 62 p.

Descriptors: *Surface runoff, *Florida, *Coastal marshes, *Drainage effects, *Land development, Sedimentation, Pollution, Disposal, Natural flow doctrine, Drainage water, Comprehensive planning, Ecosystems, Stagnant water, Riparian rights, Urban runoff, Agricultural runoff, Groundwater recharge, Saltwater intrusion, Erosion, Flood plain insurance, Judicial decisions, Wetlands, Floods, Storm runoff, *Non-point sources(Pollution), *Land use controls, *Property interests, Federal Water Pollution Control Act Amendments of 1972, Coastal waters, Coastal zones, Marine ecosystem, State policy, National Environmental Policy Act, Environmental Protection Agency, National Pollution Discharge Elimination System.

Pollution and disposal are the two major problems associated with surface water run-off in a coastal zone development. Flooding, reduction of underground drinking water and damage to coastal ecosystems primarily caused by sedimentation, could result from a poor surface water run-off plan. Surface water run-off plan problems are complex, but not impossible to solve. At law, damages and injunctive relief are the traditional remedies in pollution and damage suits caused by surface water run-off. Florida courts have not formally adopted any specific rule in this area, but case law basically reflects the Natural Flow Doc-

trine tempered with the idea that reasonable use and modifications are permissible. Surface water run-off laws and regulations have been generally left to local and regional governments in Florida. Although some state statutes, the most prominent being the Florida Air and Water Pollution Control Act, attempt to regulate surface water run-off, local city and county ordinances provide most of such control. The future responsibility for maintenance and repair of an approved system is usually locally decided. (Easterbrook-Florida) W78-01730

PUBLIC USE OF COASTAL BEACHES,

North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies. D. W. Owens, and D. J. Brower. Sea Grant Publication UNC-SG-76-08, Sea Grant College Program, North Carolina State University, Raleigh, September 1976, 335 p.

Descriptors: *Recreation facilities, *Public access, *Beaches, *Seashores, Recreation, Sands, Seashores, Shores, Natural resources, Riparian rights, Coasts, Boundaries(Property), Littoral, Easements, Zoning, Land resources, Water resources, Water utilization, Judicial decisions, Intertidal areas, Dune sands, Dunes, Public rights, Cities, *Public trust doctrine, Coastal waters, Property interests.

Although the public has property rights in coastal tidelands, private ownership and control of the dry sand and uplands threaten public enjoyment of beaches. Expanding public rights into dry sand areas and providing public passageways onto the beaches are two main aspects of the beach access problem. References to case law trace the public trust doctrine, its history and enforcement in wet sand areas. For dry sand and upland areas, the authors examine the judicial development of implied dedication as a basis for establishment of public beach ownership by use, as well as doctrines of prescriptive easement, customary rights, and implied reservation. Proposed and existing federal and state legislation regarding public rights are discussed including the Texas Open Beaches Bill. Additional public ownership, use, and access rights in the beach resource may be acquired either by purchase, sometimes prohibitively expensive, or through noncompensatory means such as zoning and subdivision ordinances. The authors also discuss the special problems relative to a dynamic shoreline and the issue of nonresident access to municipal beaches. An extensive bibliography of judicial decisions, books, governmental reports and periodical material is included. (Mulligan-Florida) W78-01731

A RECALL FOR GREENWAYS,

H. Deardorff. Parks and Recreation, Vol. 12, No. 2, p. 39a-40a, February 1977.

Descriptors: *Grassed waterways, *Land use, *Land development, *Water conservation, Land reclamation, Pollution control, Flood control, Planning, Landscaping, Land management, Environmental control, Water supply, Legislation, Public rights, Recreation, Land resources, Regional economics, Non-structural alternatives, Zoning, *Federal Water Pollution Control Act Amendments of 1972, *Open-space planning, Environmental policy, Administrative regulations, Real property law, Non-point sources(Pollution), Property.

New opportunities for greenway development are appearing with regard to water oriented land. The stereotype of a greenway as a wide, uninterrupted expanse of forest and meadow does not fit the context of existing waterfronts around the country where a wide range of landscape and land-use characteristics can be found. The water, under 201 and 208 water cleanup programs, is scheduled to

be clean by 1983 thus providing water-oriented greenway opportunities. To realize the opportunities, it should be understood that one of the most significant values of a greenway is environmental protection. Water-oriented greenways can provide nonstructural controls to prevent flooding and direct storm drainage. Industries and wastewater treatment facilities need not be considered ugly intrusions on the waterfront but should be more carefully sited and designed so that public will know they exist. In planning a greenway, it must be realized that water is a shared resource and while more prohibitive stances are appropriate in undeveloped areas, replacing vital industrial uses with open space is senseless. Communities must acquire greenway water frontage now and plan for the future. (Maass-Florida) W78-01732

LEGAL ASPECTS OF THERMAL DISCHARGES,

New York Power Authority, NY. A. J. Martin.

Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 100, No. 7, p. 1059-69, July 1974. 34 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water temperature, *Water pollution, Water law, Legal aspects, Watercourses(Legal aspects), Temperature, Riparian rights, Prior appropriation, Rivers and Harbors Act, Water pollution sources, Pollution abatement, Environmental effects, Discharge(Water), Heated water, Cooling water, Fishkill, Aquaculture, Fish farming, Legislation, Regulation, Water quality standards, *Administrative regulations, *Environmental policy, *Federal Water Pollution Control Act Amendments of 1972, Environmental Protection Agency, Licenses, Citizen suits, Nuisance(Legal aspects).

Thermal pollution, defined as the effect on a water body from any heated effluent, may be remedied by private suits. The greatest weakness of private remedies is the requirement that the pollution have occurred before suit is commenced. Federal regulatory authority stems from several statutes. Structures for cool water intake or thermal discharge may come under the provisions of the 1899 Refuse Act authorizing the Corps of Engineers to issue permits for dredging and filling in navigable waters. The Atomic Energy Act, as interpreted in the light of the National Environmental Policy Act, compels the Atomic Energy Commission to consider environmental effects of nuclear power plants. Under the Federal Power Act, the Federal Power Commission may include thermal standards in licenses for hydro-electric plants. The Federal Water Pollution Control Act Amendments of 1972 specifically recognized thermal discharges as a major source of pollution, and provided for citizen suits. The author suggests that the proper statutory approach to regulation of thermal discharges lies with flexible numerical criteria capable of modification on a case-by-case basis rather than the federal approach of strict and rigid criteria. (Jones-Florida) W78-01733

HOW SHOULD CONGRESS AMEND PL 92-500, Los Angeles County Sanitation Districts, CA. J. D. Parkhurst.

Water and Sewage Works, Vol. 123, No. 12, p. cover, 4, 59, December 1976.

Descriptors: *Waste water(Pollution), *Water pollution control, *Federal Water Pollution Control Act, *Legislation, Water quality, Water quality control, Sewage treatment, Industrial wastes, Municipal wastes, Water treatment, Water pollution, Water pollution treatment, Water quality standards, Discharge(Water), Pre-treatment(Water), Toxins, Waste water treatment, Grants, Financing, Research and development, Construction, *Effluent guidelines, *Environmental policy, *Federal Water Pollution Control Act Amend-

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ments of 1972, *National Pollution Discharge Elimination System, *Environmental Protection Agency, Effluent limitations, Non-point sources(Pollution), Point sources(Pollution), Effluent charges, Pretreatment standards(Effluent).

Efforts to make Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, more functional have been stilled by the fact that it has been treated as a public works program. The Act is inflexible because of its detailed administrative requirements and time tables. In addition, the cost of implementing the Act was grossly underestimated. Limited available funds could be maximized by distributing them to the States on the basis of population and needs, allowing the States to set treatment priorities. Environmental Protection Agency requirements for secondary treatment should be deferred where plants using oxidation ponds or deep ocean discharges are operative. Some grants or additional funding should be utilized for research into water quality treatment rather than going entirely to construction of facilities. The provisions of the Act pertaining to user charges, toxic pollutants, and pretreatment standards should be revised to provide a needed flexibility. The Congressional attitude toward no revision of the Act should be relaxed in favor of well-considered changes which would enhance its ability to achieve its goals. (Jones-Florida)

W78-01736

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS.

John Hopkins Univ., Baltimore, MD.

For primary bibliographic entry see Field 6F.

W78-01737

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE, (MEETING 75-4, 1975).

Pacific Southwest Inter-Agency Committee, San Francisco, CA.

Minutes of the 75-4 Meeting, December 9-10, Las Vegas, Nevada, 186 p.

Descriptors: *Colorado River Basin, *Governmental interrelations, *Southwest US, Administrative agencies, Federal government, Governments, State governments, Drainage programs, Institutions, Interstate, Irrigation programs, Planning, Regulation, California, Nevada, Arizona, Wyoming, Colorado, Stochastic processes, Utah, New Mexico, Water management(Applied), *Federal Water Pollution Control Act Amendments of 1972, Groundwater management, Environmental policy, Dam effects.

The Pacific Southwest Interagency Committee is composed of representatives of various federal and state agencies concerned with water and land use planning. The federal agencies include the Departments of Commerce, Army, and Transportation. The states involved are Arizona, California, Colorado, New Mexico, Utah and Wyoming. Organizationally the Committee is divided into geographical districts and technical subcommittees. The minutes of the Committee's last meeting of 1975 reflect discussion on environmental and recreational problems, vegetation management, and water management projects undertaken by subcommittees. Topics included efforts to designate certain rivers as part of the federal Wild and Scenic Rivers System; conversion of brush and range land to irrigated agricultural land; augmentation of the southern Nevada water supply; vegetative management in stripmined lands; and reports on numerous federal activities such as projects of the Water Resource Council, the Bureau of Reclamation, and the Corps of Engineers. Each state filed a report on its water projects and water resource development activities. (Sloan-Florida)

W78-01738

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CARACAS SESSION AND ITS AFTERMATH.

American Society of International Law, Washington, DC. International Law and Relations Subcommittee.

Case Western Reserve Journal of International Law, Vol 8, No 1, p 13-32, Winter 1976.

Descriptors: *International waters, *United Nations, *Conferences, *Mining, *Water resources development, Political aspects, Political constraints, Treaties, Continental shelf, Water pollution, Anadromous fish, United States, Legal aspects, Water rights, Water law, Economic impact, Economics, Water resources, Fishing, Jurisdiction, Foreign countries, International law, Coasts, *Third United Nations Law of the Sea Conference, *Economic resource zone, Archipelagos, Coastal waters, Marine environment, Marine resources, Seabed mining.

The Subcommittee on International Law and Relations met at the Caracas session of the Law of the Sea Conference held during the summer of 1974. The committee adopted procedural rules, set up committee structure, and allocated agenda items. During plenary sessions, the most significant change of position was the conditional acceptance of the 200-mile economic resource zone concept by the United Kingdom, the Soviet Union and the United States. However, major issues with respect to seabed mining remained unresolved. The three mining issues are: the question of which countries may exploit seabed resources; the degree of specificity of prospective mining codes; and the impact of seabed mining on the economies of participating nations. The conference accomplished little in bridging the large conceptual gap between developing and developed countries on almost all issues. Most observers agree that the current trend towards a nationally-oriented economic zone is shortsighted. They also note the possibility of a polarization of issues as the trend towards assertion of national jurisdiction over coastal resources is coupled with increasing voting power of developing countries in world organizations. The positions of the United States generally lacked support. Consequently, some suggest the United States act unilaterally to protect its interests. Recommendations for intersessional research are included. (Joseph-Florida)

W78-01740

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CURRENT STATUS AND THE 'INFORMAL NEGOTIATING TEXT'.

American Society of International Law, Washington, DC. International Law and Relations Subcommittee.

Case Western Reserve Journal of International Law, Vol 8, No 1, p 33-45, Winter 1976.

Descriptors: *International waters, *International law, *United Nations, *Conferences, *Coasts, Foreign countries, Treaties, Jurisdiction, Water resources development, Water rights, Legal aspects, Water law, Economic impact, Economics, Mining, Political aspects, Water resources, Political constraints, *The Third United Nations Law of the Sea Conference, Seabed mining.

Discussed here are salient data concerning the Geneva session of the Conference, organizational and procedural aspects of the session, and an analysis of the outcome. Approximately 140 states participated in the Conference which was held from March to May in 1975 to continue the work begun at the Caracas meeting during the summer of 1974. No treaties dealing with the law of the sea were adopted. However, the session did produce an 'Informal Single Negotiating Text' consisting of three parts, each drafted by one of the main committees. The first section deals with general principles, the seabed authority and its machinery, and financial issues. The second portion covers the ex-

clusive economic zone, the territorial sea and contiguous zone and colonial domination. The third section deals with marine environment and the transfer of technology. The Informal Text is not binding and has no legal effect. However, it does provide a focal point for further sessions. The report recommended possible further intersessional research. (Joseph-Florida)

W78-01741

DEEP OCEAN MINING: BEGINNING OF A NEW ERA.

J. M. Murphy.

Case Western Reserve Journal of International Law, Vol 8, No 1, p 46-68, Winter 1976. 1 fig.

Descriptors: *Mining, *Oceans, *International waters, *International law, *Conferences, Water resources development, Economic impact, Political aspects, Legal aspects, United States, Water rights, Nickel, Copper, Cobalt, Manganese, Foreign waters, Economics, Mining engineering, Mineral industry, Deep water, Excavation, *Third United Nations Law of the Sea Conference, *Seabed mining, *Minerals, Manganese nodules.

The formation of an international seabed regime to deal with seabed minerals was the most contentious of the issues before the Third Law of the Sea Conference. The mining industry estimates that approximately three trillion dollars worth of nickel, cobalt, manganese and copper is located at depths of 12,000 feet below the surface of the world's oceans. The current dependence of the United States upon foreign sources of these minerals could be vastly reduced or virtually eliminated by 1990 if American companies would use their present expertise to mine ocean seabeds. However, private companies have withheld taking such action because of the uncertainty surrounding the seabed mining issue at the Conference. Although there is no existing international law restricting the freedom of the seas for seabed mining purposes, the current absence of political sponsorship and security of tenure is an unacceptable business risk. International and domestic laws affecting seabed mining are discussed chronologically. Citing the dismal failure of the Conference to develop a seabed regime, the author urges the United States to pass legislation enabling it to maintain an independently secure source of valuable minerals through mining of the seas. (Joseph-Florida)

W78-01742

CANADA AND THE UNITED STATES: DISPUTE SETTLEMENT AND THE INTERNATIONAL JOINT COMMISSION - CAN THIS EXPERIENCE BE APPLIED TO LAW OF THE SEA ISSUES.

M. Cohen.

Case Western Reserve Journal of International Law, Vol 8, No 1, p 69-83, Winter 1976. 2 tab.

Descriptors: *International Joint Commission, *Canada, *International Commissions, *Treaties, *Law of the Sea, Oceans, Fishing, Continental shelf, Conferences, Political constraints, Political aspects, Water resources development, Water rights, Mining, Water resources, Economic impact, Boundaries(Property).
Identifiers: *Boundary waters treaty.

The Third United Nations Conference on the Law of the Sea has an importance for Canada and the United States which is both bilateral and multilateral. Many of the oceanic issues being raised at the Conference affect these two countries in their capacities as neighbors. This article briefly describes the basis of Canadian-United States relations and the experience of the two countries under the Boundary Waters Treaty and with the International Joint Commission. The question is raised as to whether the concepts underlying the Treaty and the Commission can provide a model for the settlement of some pending Canadian-

United States oceanic disputes if the Conference produces a final binding agreement. The prime lesson from the International Joint Commission is that if facts cannot be commonly perceived and followed through to the same conclusions, disputes will fester, thriving on ambiguity and rhetoric. This lesson seems applicable to the unsettled law of the sea disputes which would be suitable subjects for common fact-finding on a permanent basis. A stabilizing influence in Canadian-United States relations would hopefully result. (Joseph-Florida) W78-01743

THE POSITION OF THE AMERICAN BAR ASSOCIATION ON THE LAW OF THE SEA,
American Bar Association, Washington, DC.
Natural Resources Law Section.

L. W. Finlay.

Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 84-109, Winter, 1976.

Descriptors: *International waters, *International law, *Water resources development, *United Nations, *Treaties, Economic impact, Legal impact, Political constraints, Political aspects, Water rights, Mining, Resource development, Deep water, Coasts, Conferences, Legal aspects, Political aspects, Continental shelf, Law of the Sea.
Identifiers: *Third United Nations Law of the Sea Conference, *Territorial sea, Deep water ports, Territorial seas(Jurisdiction).

Substantive paragraphs are extracted here from the entire text of the American Bar Association (ABA) 1973 resolution regarding natural resources of the sea. The ABA's position is compared to that taken by the United Nations Committee of the World Peace Through Law Center. Among other things, the ABA's resolutions urge the following: (1) that the United States protect all seabed resources within its continental margin; (2) that any international seabed resource authority have regulatory and administrative powers only with no control over volume of production or pricing; (3) that the United States implement exploration and exploitation of seabed resources beyond its national jurisdiction; (4) that straits which have been historically open for international maritime traffic be protected international waters; and (5) that coastal states have the right to establish and control deep water ports on their continental margins adjacent to their territorial sea. The author contends that to be viable, any treaty evolving from the Third United Nations Conference on the Law of the Sea must gain broad acceptance from the community of nations. The need for a consensus of those nations whose existing rights under present norms of international law would be significantly impaired is also vital. (Joseph-Florida) W78-01744

INTERNATIONAL ENVIRONMENTAL LAW, INTERNATIONAL CONVENTIONS CONCERNING OIL POLLUTION AT SEA,

Inter-Governmental Maritime Consultative Organization, London (England). Legal Div.
T. A. Mensah.

Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 110-130, Winter 1976.

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, *International waters, *International law, Accidents, Environmental effect, Environment, Transportation, Water pollution sources, Ships, Oil industry, Environmental control, Conferences, Water resources, Water quality, Pollution abatement, Oil wastes, Water pollution, Treaties, Political aspects, Oceans, Tankers, Supertankers, Vessels, Discharge(Oil), Territorial waters.

Hydrocarbon oil has recently emerged as one of the most notorious sources of marine pollution attracting the concern of national and international movements and organizations. The risk of pollu-

tion from accidents in the production and transportation of oil increases with the increasing world-wide use and development of oil. There is general agreement that the pollution problem can be effectively handled only if dealt with on an international basis. The international legal community has taken measures through international conventions to ensure effective protection of the seas from oil pollution. The conventions and their objectives are discussed, including: (1) the prevention and minimization of intentional oil discharges from ships; (2) the prevention of accidents which may result in the escape or discharge of oil; (3) the establishment of arrangements and procedures for dealing with pollution or the threat of pollution as a result of accidents; and (4) the establishment of procedures for assigning liability for damages as a result of pollution. (Joseph-Florida) W78-01745

IMCO: AN ENVIRONMENTALIST'S PERSPECTIVE,

Center for Law and Social Policy, Washington, DC.
E. V. C. Greenberg.

Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 131-48, Winter 1976.

Descriptors: *Oil pollution, *International commissions, *Water pollution control, *International law, International waters, United Nations, Oceans, Oil spills, Accidents, Water pollution sources, Water pollution effects, Treaties, Ships, Oil industry, Oil wastes, Water pollution, Political aspects, Environmental effects, Environment, Environmental control, *Intergovernmental Maritime Consultative Organization, Supertankers, Tankers, Vessels, Discharge(Oil).

The frequency of oil tanker accidents has increased as has the growth of the total amount of oil discharged into the oceans from normal tanker operations. The troublesome environmental problems resulting from the growth of oil traffic must be solved with international solutions. Presently, the Intergovernmental Maritime Consultative Organization (IMCO) is the agency charged with providing such solutions. This paper explores the structure, history, and current activities of IMCO in an effort to evaluate whether IMCO is capable of providing these solutions. IMCO, created at the 1958 United Nations Maritime Conference held in Geneva, to deal with maritime affairs, has been the dominant international agency in the area of vessel source pollution. It has, over the years, developed guidelines and recommendations relating to marine pollution from ships. However, environmentalists criticize IMCO charging that it is dominated by shipping interests. Further, until spring of 1975, none of its agreements negotiated since 1966 had come into force. The author concludes that the nations of the world rather than IMCO are to blame for many of our present marine pollution problems since IMCO is only as effective as its member nations allow. (Joseph-Florida) W78-01746

TERRITORIAL WATERS-OWNERSHIP AND CONTROL, THE UNITED STATES HAS SOVEREIGN RIGHTS TO THE SEABED BENEATH THE ATLANTIC OCEAN LYING BEYOND THE 3-MILE TERRITORIAL LIMIT TO THE EXCLUSION OF THE ATLANTIC COASTAL STATES (COMMENT ON UNITED STATES V. MAINE).

Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 240-56, Winter 1976.

Descriptors: *Atlantic Ocean, *Ownership of beds, *Boundary disputes, *State jurisdiction, *Continental shelf, Water resources development, Maine, Beds, Coasts, Boundaries(Property), United States, State governments, Exploration, Exploitation, Environmental effects, Water resources, Judicial decisions, Legal aspects,

Federal jurisdiction, *Coastal states, *Territorial limits, Territorial waters, Territorial seas(Jurisdiction).

In a 1975 case decided by United States Supreme Court, the United States filed a complaint against the Atlantic Coastal States from Maine to Florida. The United States claimed exclusive sovereign rights in submerged lands beneath the Atlantic Ocean located beyond the three miles seaward from the outer limits of each respective state's coastal waters and the outer edge of the continental shelf. The United States also sought declaratory relief to obtain such rights for the purposes of exploration and exploitation of the seabed. With two exceptions, defendant states claimed that they held title to the disputed areas by virtue of succession to the title formerly held by England, never having divested themselves of this title when joining the Union. A Special Master found in favor of the United States and the Supreme Court affirmed, reasoning that title to the seabed became vested in the federal government when the defendant states were admitted to the Union. The possible effect of this decision on the law of other nations, on the petroleum and fishing industries, and on environmental protection policy is discussed. This decision leaves undecided the issue of whether states could have rights beyond the three mile limit if a twelve-mile territorial limit is adopted. (Joseph-Florida) W78-01747

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).

Hearings—Subcomm. on Water Resources, Comm. on Public Works, U.S. Senate, June 15, 1976, Serial 94-HS0. 154 p.

Descriptors: *Lake Ontario, *Erosion, *Shores, *Shore protection, Great Lakes, St. Lawrence River, St. Lawrence Seaway, Real property, Property values, Water levels, Legislation, Riparian land, Legal aspects, Canada, Treaties, International law, Land tenure, International Joint Commission, *Congressional hearings, *Corps of Engineers, *Dam effects, Property interests, Private interest groups, Navigability.

Residents along Lake Ontario have reported that severe shoreline erosion was continuing unabated due to artificial maintenance of the lake at abnormally high levels. Senate Bill S. 3548 was the focal point of a hearing to investigate the problem. The bill directs the Army Corps of Engineers to present a plan for shoreline protection to Congress. Lakeshore residents testified to the extent of damage done to their property as a result of the high levels of the lake, which they attributed to regulation by the International Joint Commission (IJC). Their testimony indicated a feeling that the interests of the competing users, the shipping and power industries, were being preferred over their property interests. They requested an overall decrease in the level of regulation. Testimony from the Chairman of the United States section of the IJC, a technical advisor, and a manager of a power authority attributed the higher lake levels to greater snowmelt runoff and rainfall; their testimony stated that under existing structural and regulating constraints, everything possible had been done. Statements, communications, and photographs are appended to the hearing transcript. (Jones-Florida) W78-01748

LAW OF THE SEA (NEW YORK SESSION OF THE THIRD U.N. LAW OF THE SEA CONFERENCE).

Hearings—Subcomm. on Oceans and International Environment—Comm. on Foreign Relations, U.S. Senate, May 20, 1976, 40 p.

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Descriptors: *Law of the Sea, *Treaties, *Water pollution control, *Mining, *Ships, Foreign waters, International law, Mineral industry, Marine geology, Continental shelf, Negotiations, Usufructuary right, Federal jurisdiction, Water rights, Governments, Oceans, Water law, Legal aspects, *Congressional hearings, *Law of the Sea Conference, *Minerals, *Seabed mining, Coastal waters, Coastal zones, Territorial seas (Jurisdiction), Territorial waters, Vessels.

The head of the United States delegation to the Law of the Sea Conference reported on the progress of the conference negotiations. The Committee I negotiations dealt with the exploitation of the deep seabed; Committee II delimited the zones of control into a 12-mile territorial sea and a 200-mile economic zone; and Committee III dealt with the area of pollution and scientific research. A fourth section of the treaty provided for compulsory and binding settlement of disputes. Other topics upon which the delegate was questioned related to the effectiveness of the treaty's pollution control provisions; the reason for denying environmental groups access to a seabed tribunal; and whether the Senate's power to ratify treaties would be affected by provisional application of the treaty in selected areas. Additional problem areas discussed include: creation of a deep seabed tribunal; the extent of the seabed authority to regulate pollution; access of landlocked nations to the ocean resources; and environmental regulations for vessels passing through territorial seas. An appendix to the hearing record contains the delegate's responses to additional questions for the record. (Jones-Florida) W78-01749

STATE V. SAN LUIS OBISPO SPORTSMAN'S ASSOCIATION (RIGHT TO FISH ON STATE-OWNED LANDS).

138 Cal. Rptr. 332-38 (App. 1977).

Descriptors: *Fishing, *Reservoirs, *California, *Public rights, *Public lands, Reservoir operation, Reservoir fisheries, Contracts, Operations, Recreation, Regulation, Water supply, Fish, Fisheries, Sport fishing, Legal aspects, Water quality, Water quality control, Constitutional law, Trespass, Water pollution, Domestic water, *Water rights (Non-riparian).

The plaintiffs, city and state, sought to enjoin fisherman from trespassing at a reservoir claiming danger of contamination of the reservoir water. The defendant sportsmen's association cross-claimed for an order compelling the city and state to provide fishing in the reservoir with appropriate regulations, control and management. The plaintiffs then sought declaratory relief that entry into the reservoir for fishing purposes was without legal right so long as the reservoir was not opened to public fishing. The Second District Court of Appeal of California affirmed the lower court which held the plaintiffs responsible for providing adequate fishing facilities and maintaining the quality of the reservoir based upon a contract between the parties. This included an implicit agreement by the plaintiffs to finance their fair share of the costs. However, the court noted that under the California Constitution not all state-owned land is "public lands" on which a right to fish exists. Where the property had been private property before its acquisition by the state, the presence of a non-navigable stream or creek did not give any person a right to fish therein. (Kastner-Florida) W78-01750

CHARLESTONE STONE PRODUCTS CO., INC. V. ANDRUS (WATER DEEMED A MINERAL WITHIN MEANING OF PLACER MINING LAWS).

553 F.2d 1209-16 (9th Cir. 1977).

Descriptors: *Placer mining, *Economic justification, *Water wells, *Water utilization, Nevada, Gravels, Sands, Mining, Productivity, Profit, Construction materials, Mineral industry, Groundwater, Water law, Water rights, Legislation, Hydraulic mining water, Legal review, Judicial decisions, Administrative decisions, *Minerals.

Defendant Secretary of the Interior challenged the validity of placer sand and gravel mining locations claimed by plaintiff stone company. The Ninth Circuit Court of Appeals affirmed the district court decision finding sixteen valid claims and granting access to a seventeenth for water utilization purposes. The court upheld the plaintiff's right to appropriate and utilize as a mineral the water within any claims which met a two prong test of value and success in development. The court noted that the term "mineral" had been held to embrace water, particularly subterranean water, irrespective of the character and quantity of salts and gases which may be in solution. Acts of Congress which allowed a prospector to enter and patent placer claims for valuable minerals did not expressly exclude water and the court declined to find an implication that Congress intended to reserve water from those minerals allowed to be located and recovered. The court was satisfied that plaintiff had shown a profitable market for water recovered upon the seventeenth claim and held that its claim for the extraction of that water is valid. (Mulligan-Florida) W78-01751

DREDGING OPERATIONS.

Nev. Rev. Stat. sec. 503.425 (1975).

Descriptors: *Nevada, *Rivers, *Dredging, *Permits, Administration, Legal aspects, Fish conservation, Control, State jurisdiction, Administrative agencies, Legislation, Mechanical equipment, Environmental control, Regulation, Projects, Lakes, Protection, Bodies of water, Streams, *Licenses, Administrative regulations, Environmental policy, State policy.

Permits are required before any person may use vacuum or suction dredge equipment in any river, stream, or lake of Nevada. Applications for a permit shall specify the location and the type and size of the equipment to be used. If the dredging operations will not be deleterious to fish, a permit shall be issued. It is unlawful to conduct dredging operations without a permit, to conduct such operation outside the area designated on the permit, or to utilize equipment other than that specified in the permit. (Cocheu-Florida) W78-01752

PROTECTION OF LAKE TAHOE AND ITS WATERSHED.

Nev. Rev. Stat. secs 445.080 thru 445.120 (1975).

Descriptors: *Nevada, *Permits, *Water pollution control, Construction, Watershed management, Sewage disposal, Water management (Applied), Regulation, Dredging, Public health, Shore protection, Control, Administrative agencies, Water quality control, Penalties (Legal), Lake basins, Watersheds (Basins), Legislation, Law enforcement, Water law, Effluents, *Administrative regulations, Environmental policy, Fill permits, Hazardous substances (Pollution), Liability, Licenses, State policy.

Written permission must be obtained from the bureau of environmental health before any person, firm, association or corporation can construct any dwelling or building for human occupancy or commercial use, any drinking water procurement or distribution system, or any sewage collection or disposal system in the Lake Tahoe watershed. Permission is also required for any construction in Lake Tahoe, any alteration of the shoreline, or any dredge and fill operation. No permits will be issued if a health hazard or threat to water quality would

result. Discharge of wastes into the lake or its watershed is prohibited except in certain instances which require a discharge permit. The bureau of environmental health is authorized to enforce reasonable regulations and to inspect any property in the watershed area to determine compliance with the regulations. Anyone violating any provisions of this act or any regulations promulgated to enforce it shall be guilty of a misdemeanor. (Cocheu-Florida) W78-01753

ADJUDICATION OF VESTED WATER RIGHTS.

Nev. Rev. Stat. sec 533.090 thru 533.320 (1975).

Descriptors: *Nevada, *Legislation, *Adjudication procedure, *Water rights, Decision making, Legal aspects, Water law, Administrative agencies, Preferences (Water rights), Water allocation (Policy), Relative rights, Remedies, Prior appropriation, Priorities, Flow, Water distribution (Applied), Stream, Judicial decisions, Water policy, *Administrative regulations, Property interests, State policy.

The state of Nevada has enacted legislation relating to the adjudication of water rights. The state engineer makes determinations of relative rights of claimants to water of any stream system. He is required to investigate the flow of the stream and to gather other data needed for determining the water rights. After a hearing, the state engineer enters an order of determination which is filed with the evidence and transcript of testimony with the clerk of the district court. This order is equivalent to a complaint in a civil action and a hearing date is set. After hearings, the court enters a final decree affirming or modifying the order of the state engineer. An appeal may be taken from this decree within three years. Upon final determination, the state engineer issues certificates of relative rights. Guidelines are provided for administration of the stream system including: (1) appointment of commissioners; (2) supervision of water distribution and related funds; (3) establishment of state water districts; and (4) distribution of water rights not adjudicated in the above manner. Guidelines are established for the state engineer's budget for stream system or water district expenses. (Mulligan-Florida) W78-01754

DAMS AND OTHER OBSTRUCTIONS.

Nev. Rev. Stat. secs 535.010 thru 535.120 (1975).

Descriptors: *Nevada, *Legislation, *Dam construction, *Dams, *Regulation, Barriers, Diversion, Dam design, Diversion dams, Bypasses, Dikes, Electric power, Fish barriers, Fish passages, Flood control, Flow control, Reservoirs, River regulation, Water control, Water storage, Water supply, Beavers, Obstruction to flow, *Dam effects.

Dam construction in Nevada requires a permit to appropriate water as well approval by the state engineer of the proposed structural plans. Copies of applications for the construction of dams are filed with the state board of fish and game commissioners. In the construction, alteration, or enlargement of a dam the dam owner must provide for fishways over or around dams and for protection of fish in streams. The state engineer shall make safety inspections of all dams. He may also order removal of any dam, diversion works or obstruction not legally established. Where beaver dams on privately-owned lands interfere with the lawful distribution of water, the state engineer may, upon receiving complaint, serve notice of the planned removal of the beaver and may remove the dam. Construction of a dam on any river within two miles of an incorporated city requires construction of a weir large enough to permit free passage of water not used for irrigation purposes. It is unlawful for an owner of any sawmill, slaughterhouse, brewery, or tannery to obstruct the natural flow of

water. Penalties for removal or destruction of a dam or bridge are set forth. (Mulligan-Florida) W78-01755

DITCHES, CANALS, FLUMES AND OTHER CONDUITS.

Nev. Rev. Stat. secs 536.010 thru 536.120 (1975).

Descriptors: *Nevada, *Legislation, *Conduits, *Ditches, *Regulation, Canals, Canal construction, Canal design, Conveyance structures, Aqueducts, Civil engineering, Flumes, Gates, Flood control, Sluices, Water conveyance, Irrigation ditches, Bypasses, Water management(Applied), Diversion structures, Right-of-way, Damages.

The state of Nevada has enacted legislation governing ditches, canals, flumes and other conduits. Owners of ditches or canals must maintain a substantial headgate near the point of water diversion as well as any measuring devices required by the state engineer. Refusal to comply with these regulations may result in the state engineer's closing the ditch, opening the reservoir sluice gates or installing the required devices at the owner's expense. Where ditches are jointly-owned, responsibility for maintenance work shall be divided proportionately. Guidelines are offered for recovery of the reasonable expense of such work from an owner in default of his responsibility. Requirements for construction of ditches or flumes, including certificate records, examination and survey right of ways, and appraisals of private lands to be used for that purpose, are given. The owner of a ditch or flume shall have the undisturbed right and privilege of water flowing through it, to the extent it does not interfere with any prior or existing claim or right. Penalties for unlawful injury to or destruction of any canal, flume, aqueduct, reservoir, ditch or conduit are set forth. (Mulligan-Florida) W78-01756

NAVIGABLE WATERS.

Nev. Rev. Stat. secs 537.010 thru 537.030 (1975).

Descriptors: *Nevada, *Navigable rivers, *Ownership of beds, *High water mark, *Navigable waters, Legislation, Governments, Legal aspects, State governments, Colorado River, Banks, Lakes, Boundaries(Property), Streambeds, Bodies of water, River beds, Water law, Rivers, Land tenure, *Navigability, *Property interests, Property, State policy.

All of the Colorado River within Nevada is considered a navigable stream for the purposes of fixing ownership of its banks and beds. All of the Virgin River transverse Nevada and its sources confluent above St. Thomas is a navigable stream for purposes of fixing ownership to its banks and beds. Title to lands below the high water mark of both rivers is held by the state. The Winnemucca Lake located in Nevada is a navigable body of water, and title to its bed is held by the state. (Cocheu-Florida) W78-01757

STATE OF ALABAMA EX REL. BAXLEY V. ENVIRONMENTAL PROTECTION AGENCY (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).

557 F.2d 1101-14 (5th Cir. 1977).

Descriptors: *Standards, *Federal Water Pollution Control Act, *Waste water disposal, *Industrial wastes, *Permits, Alabama, Discharge(Water), Iron, Steel, Water pollution, Pollutants, Water quality control, Administrative decisions, Water pollution sources, Water quality, Waste treatment, Treatment, Legal review, Water pollution treatment, Water quality standards, Regulation, *Federal Water Pollution Control Act Amend-

ments of 1972, *Environmental Protection Agency, *National Pollution Discharge Elimination System.

Petitions were filed for review of administrative permits and orders issued by the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act (FWPCA). The EPA proposed to issue a National Pollutant Discharge Elimination System (NPDES) permit to a pipe and foundry company. The petitioners contended the proposed permit was not consistent with the requirements of the FWPCA Amendments of 1972. The EPA argued that the appropriate 'best practicable technology' (BPT) limitations to be applied in an NPDES permit are those in effect at the time of the initial permit issuance. The Fifth Circuit Court of Appeals agreed and further held that it was appropriate for the EPA to rely principally upon its own 'personalized' BPT, as established in a consent decree resolving suit brought by the agency against the applicant for the permit. The court noted that the permit was issued in full compliance with the public participation requirement. The court also held that, in the absence of superseding federal standard lawfully issued by the EPA, the state water quality standard of Fish and Wildlife as a Goal, was the applicable standard until altered by the state itself. (Beamer-Florida) W78-01758

EISEMAN V. ANDRUS (POWER OF PARK SERVICE TO ALLOCATE USER DAYS ON COLORADO RIVER).

433 F. Supp. 1103-07 (D. Ariz. 1977).

Descriptors: *Colorado River, *Permits, *National parks, *Administrative decisions, *Recreation demand, Regulation, Federal jurisdiction, Arizona, Environment, Water law, Constitutional law, Recreation facilities, Safety, Ecology, History, Planning, Recreation, Rivers, Management, Administrative agencies, Public access, *National Park Service, *Administrative regulations.

Because of the ecological threat to the Colorado River due to intensified use, the defendant National Park Service restricted the use through a plan based on the historic use of the river. The plaintiffs, who were denied permits to run the river privately instead of through the Park concessionaire, challenged the allocation of permits between commercial and non-commercial users. The plaintiffs contended that allocation of user days was rule-making and had been done without complying with the allocation of user days was rule-making and had been done without complying with the Administrative Procedure Act. The United States District Court in Arizona upheld the defendant's interim management plan saying that historical river use was a rational basis for allocation of river use. The court found that the government has a legitimate objective in providing for the greatest possible public enjoyment of the river experience subject to ecological, environmental and public safety limitations. The court also denied the plaintiffs' equal protection argument saying that the dangers in the river run made the commercial/non-commercial distinction necessary. (McPherson-Florida) W78-01759

BUFFALO RIVER CONSERVATION AND RECREATION COUNCIL V. NATIONAL PARK SERVICE (PRESCRIPTIVE EASEMENT OVER NON-NAVIGABLE RIVER).

558 F.2d 1342-45 (8th Cir. 1977).

Descriptors: *National parks, *Non-navigable waters, *Prescriptive rights, *Land tenure, Arkansas, Legislation, Public rights, Public lands, Parks, Recreation facilities, Bodies of water, Riparian rights, Easements, Public access, River beds, Streambeds, Rivers, Right-of-way, Legal aspects, Water law, Boundaries(Property).

Identifiers: *National Park Service, Injunctive relief, Environmental impact statement, Property interests, Navigation obstructions.

Plaintiff property owners' organization brought an action against the National Park Service and park officials challenging the constitutionality of a statute establishing a national park. The property owners owned land within the park boundaries that had yet to be acquired because of lack of funds. They contended that the district court had erred in holding that the public had acquired a prescriptive right to float down the river and that therefore the property owners could not obstruct the river. The Eighth Circuit Court of Appeals said that the evidence sustained the finding that the public's usage of the non-navigable river and its bed had been open an adverse for more than seven years. The court therefore held that, under Arkansas law, a prescriptive right was obtained by the public to travel over the non-navigable stream and its bed. The court felt that the cases dealing with prescriptive rights-of-way over land were applicable by analogy to rights-of-way over non-navigable streams and their beds. (Beamer-Florida) W78-01760

ENVIRONMENTAL DEFENSE FUND V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENTS AS A BASIS FOR CONGRESSIONAL DECISIONS).

421 F. Supp. 1083-89 (E.D. Ark. 1976).

Descriptors: *Arkansas, *Federal Project Policy, *Environmental effects, *Watercourses(Legal), Drainage programs, Environmental engineering, Mallard duck, Backwater, Federal government, Dredging, Environment, Environmental control, Wildlife management, Legal review, Groundwater, Downstream, Projects, Sedimentation, Water control, Flooding. Identifiers: *Environmental Impact Statement, *National Environmental Policy Act, *Corps of Engineers, *Injunctive relief, Flyways, Environmental policy, Mississippi flyway.

By the Flood Control Act of 1950, Congress authorized construction of the Cache River-Bayou DeView Channelization Project to relieve backwater flooding. The Army Corps of Engineers filed a final environmental impact statement (EIS) as required by the National Environmental Policy Act of 1969 (NEPA). A year later, a draft environmental statement was submitted which discussed a plan to mitigate wildlife losses. Plaintiff environmental group successfully enjoined construction because of the inadequacy of the EIS. After filing a new revised final EIS, the Secretary of the Army moved to dissolve the injunction. The United States District Court for the Eastern District of Arkansas held that the final EIS was adequate, even though it did not discuss a plan to mitigate wildlife losses and failed to adequately discuss cumulative effects of the project on mallard duck populations in the Mississippi flyway, on groundwater, and on downstream sedimentation and flooding. The court stated that NEPA does not require delaying the publication of an EIS to incorporate contemporaneous events which could not have been foreseen. In addition, an EIS does not have to be perfect to form a sufficient basis for executive or Congressional decision. (Denker-Florida) W78-01761

LEDFORD V. UNITED STATES (GOVERNMENTAL IMMUNITY TO NEGLIGENCE ACTIONS FOR RECOVERY OF DAMAGES SUSTAINED BY FLOODING).

429 F. Supp. 204-06 (W.D. Okla. 1977).

Descriptors: *Flood damage, *Floods, *Federal government, *Dams, Damages, Legal aspects, Water law, Reservoir construction, Reservoirs, Flood control, Reservoir leakage, Accidents, Negligence, Field crops, Dam construction, Damsites, Crops, Compensation.

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Identifiers: *Dam effects, *Immunity(Legal aspects), *Liability, Property, Property interests, Federal Torts Claims Act, Immunity Act.

Plaintiff, crop owners, sought compensation for damages to their crops allegedly resulting from defendant United States' negligence in failing to take precautions against flooding in the construction work related to Waurika Dam and Reservoir Project. The defendant moved for dismissal contending that the complaint dealt with a discretionary function, liability for which is precluded by the Federal Tort Claims Act. The defendant further contended that liability was precluded by the Immunity Act which provides that the United States cannot be held liable for any form of flood damage. The plaintiff contended that the omissions which resulted in the flooding were not discretionary in nature and therefore not precluded by the Federal Torts Claim Act, and that the flood in question was excepted from the Immunity Act. The United States District Court for the Western District of Oklahoma dismissed the complaint holding that there are no exceptions to the Immunity Act. The court therefore found it unnecessary to rule on whether the omission was a discretionary function since liability would be denied by the Immunity Act. (Brightman-Florida) W78-01762

SHELL OIL COMPANY V. TRAIN
(ADMINISTRATIVE RULINGS ON EFFLUENT LIMITATIONS CHALLENGEABLE ONLY IN FEDERAL CIRCUIT COURTS).
415 F.Supp. 70-78 (N.D. Cal. 1976).

Descriptors: *Jurisdiction, *California, *Effluents, *Oil industry, *Federal Water Pollution Control Act, Judicial decisions, Legal aspects, Legal review, State governments, Federal government, Administrative agencies, Governmental interrelations, Permits, Control, Legislation, Regulation, Water pollution sources, Discharge(Water), Industrial wastes, Water pollution, Liquid wastes, Oil wastes, *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972, Effluent guidelines, Effluent limitations.

Plaintiff oil company brought suit in the United States District Court against the Environmental Protection Agency (EPA) challenging regulations governing the petroleum industry and the denial by the state of a variance from specific effluent regulations governing plaintiff's refinery. Defendant EPA moved to dismiss for lack of jurisdiction. The District Court was forced to interpret Section 509 of the Federal Water Pollution Control Act Amendments of 1972 in order to resolve the jurisdictional problem. If the source of the EPA's effluent limitation authority derived from Section 301, exclusive jurisdiction would lie in the Courts of Appeals. If derived from Section 304, jurisdiction would lie in the District Courts under the Administrative Procedure Act. The court noted that the majority position among the Circuit Courts of Appeals found the EPA's authority under Section 301. The court then dismissed plaintiff's action as it found itself without jurisdiction to review the administrative determinations challenged in plaintiff's complaint. The court also refused to find federal action sufficient to invoke federal jurisdiction in the EPA's failure to veto the state's variance denial. (Moorhouse-Florida) W78-01763

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5G.
W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 5G.

W78-01812

ESTUARINE MANAGEMENT—THE INTERGOVERNMENTAL DIMENSION,

J. J. Bosley.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467. Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 629-635, 16 footnotes.

Descriptors: *Estuarine environment, *Legal aspects, *Resources development, *Governmental interrelations, Pollution abatement, Management, Water pollution control, *Outer Continental Shelf.

This paper provides a synoptic overview of the principal existing and pending federal laws and policies affecting the management of the nation's estuaries and estuarine zone. Specific attention is given to the influence these laws and policies have on the active management of such resources at the state, regional, and local levels. Using this analysis, the adequacy of extant federal policies to achieve established national goals and objectives on the preservation and conservation of estuarine resources is assessed. Finally, from this analysis current issues are identified, and proposed recommendations are made for federal policies to more adequately provide an institutional and management framework to protect these vital resources. (Sinha-OEIS) W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES

Georgia Univ., Athens.
For primary bibliographic entry see Field 5G.
W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5G.
W78-01815

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT,
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 6B.
W78-01821

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
G. C. Taylor, Jr.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Professional Paper 911, 1976. 146 p, 57 fig, 6 tab.

Descriptors: *Reviews, *Programs, *Water resources, *Foreign countries, *Federal Government, United Nations, Inter-agency cooperation, International commissions, Projects, Publications, Hydrologic data, Surface waters, Groundwater, Available water, Water quality, Water resources development, Training, Costs, *U.S. Geological Survey, *International activities, *Developing countries.

The review describes the history of the U.S. Geological Survey's (USGS) activities in international water-resources investigations and institutional development as well as exchange in scientific and applied hydrology during 1940-70. The bulk of these activities has been carried out under

the auspices of the U.S. Department of State, U.S. Agency for International Development and its predecessors, the United Nations and its specialized agencies, and the regional intergovernmental agencies. The central objectives of the USGS' international water-resources activities have been to strengthen the administrative, staff, and operational functions of counterpart governmental hydrological and water-resources agencies; to improve the skills and capabilities of host-country scientific, engineering, and technical personnel; to exchange research specialists and publications in the sharing of advances in hydrological knowledge and methodology; and to participate in mutually beneficial international organizations, symposia, conferences, seminars, and special programs dedicated to various aspects of scientific and applied hydrology. Between 1940 and 1970, USGS hydrogeologists, water chemists, engineers, and hydrologists completed 340 short- and long-term project-oriented international assignments in some 80 host countries. During the same time more than 428 water scientists, engineers, and technicians from 60 countries have received academic and in-service training through USGS water-resources facilities in the United States. Also in this period some 336 reports of a technical and scientific nature have resulted from water-resources projects in the U.S. bilateral program. (Woodard-USGS) W78-01866

JOINT USE OF INTERNATIONAL WATER RESOURCES

Mahart, Budapest (Hungary).
I. Kovacs, and L. David.
AMBIO, Vol. 6, No. 1, p. 87-90, 1977. 2 fig, 4 ref.

Descriptors: *International waters, *Riparian waters, *Planning, *River basin development, Riparian rights, Water resources, Water utilization, Regulation, Governmental interrelations.
Identifiers: Danube River, Tisza River.

International rivers, natural watercourses which pass through two or more states or forms a border between states, require long-term planning based on a gradual approach, more so than for national basins. The need for international cooperation arises first on separate activities, such as navigation, flood control, water transfer and storage, and water quality protection. Data collection and water demand forecasting come at this stage. Construction of joint projects and coordination of national water management plans are later developments. One method of implementing the gradual approach is for riparian countries to prepare plans for their own part of the basin, and to coordinate the plans at a later stage. A second method is for an international planning team to prepare the long-term plan for the basin. The UN is currently considering the Helsinki Rules of 1966 as a basis for formal codification of international river utilization regulations. The Helsinki Rules prohibit polluting the river or unilateral use which interferes with the rights of neighboring states, and require flood control measures. Traditionally, states are sovereign in the part of the river in their territory, the freedom of merchant shipping is guaranteed during peacetime, navigation is normally free of charge, and trade between two ports of a given state is the right of the state in question. The Danube and Tisza river basins are offered as illustrations of these principles. (Lynch-Wisconsin) W78-02010

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES

Environmental Protection Agency, Washington, DC. Office of Water Program Operations; and Environmental Protection Agency, Washington, DC. Oil and Special Materials Control Div.
For primary bibliographic entry see Field 5G.
W78-02095

WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY.
Black and Veatch, Kansas City, MO.
For primary bibliographic entry see Field 5G.
W78-02096

WATER USES AND MISUSES: A WORLD VIEW.
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-02097

THE LAKE CHELAN CASE—ANOTHER VIEW.
Washington State Bar Association, Seattle.
E. A. Rauscher.
Washington Law Review, Vol. 45, No. 2, p 523-33,
April 1970.

Descriptors: *Washington, *Riparian rights, *Lake shores, *Land tenure, *Land development, Landfills, Boundaries(Property), Judicial decisions, Banks, Shores, Navigation, Recreation, Water law, Recreation facilities, Legal aspects, Water resources development, Water rights, Public rights, Navigable waters, Prescriptive rights, Riparian land, Water utilization, *Submerged lands, Navigability, Property, Property interests, Real property law, State policy, Land use controls.

One interpretation of the Washington Supreme Court decision in *Wilbour v. Gallagher*, ordering the removal of landfill as an obstruction to public navigation rights, is that the rule extends beyond the artificially fluctuating levels of Lake Chelan to all tidelands and shorelands are not precluded from development by that decision. The author feels that the fact situation of the *Wilbour* case is unique and limited. Private ownership of such lands in Washington is historically and legally well established, and has never been in conflict with the public's navigation rights. Public and private rights are delineated by the inner harbor line, the line of extremely low tide, or the line of navigability. The author asserts that it is too late for the state to prevent developers from filling previously sold lands by extending public navigation rights. He concludes that doctrines such as eminent domain, grant from the owner, or prescription must be employed to acquire public rights in privately-owned tidelands or shorelands since the Lake Chelan decision did not overrule established principles of private ownership. (Mulligan-Florida)
W78-02098

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS).
For primary bibliographic entry see Field 5G.
W78-02099

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING.
W. M. Kleppinger.
Land and Water Law Review, Vol 12, No 2, p 457-84, 1977.

Descriptors: *Wyoming, *Reservation Doctrine, *Water rights, *Federal-state water rights conflict, *Adjudication procedure, State jurisdiction, References(Water rights), Jurisdiction, Legal aspects, Federal government, Federal reservations, Federal jurisdiction, Arid lands, Judicial decisions, Legal review, Water supply, Supply, Water shortage, Water demand, Prior appropriation, Appropriation, Legislation, *Sovereign immunity, State policy, Procedural aspects, Declaratory judgments.

Increasing populations in the western United States have expanded demand for water to the point that potential demand far exceeds present ability to increase supply. A product of this in-

crease in demand has been the development of conflicting claims between federal and state authorities to the ownership, control and administration of western waters. At the center of the federal-state controversy is the reservation doctrine which operates to create water rights in the federal government independent of and paramount to private water rights derived through state law. This paramount federal claim has tended to impair planning and development at the state level. The McCarran Amendment, enacted as a waiver of sovereign immunity, granted the states the power to enjoin the United States in any general litigation involving all water rights on a stream. The Wyoming legislature attempted to provide a mechanism, under the McCarran Amendment, whereby federal claims to water based on the reserved rights doctrine might be quantified and coordinated with rights derived from state law. The primary question concerning the statute is whether the adjudication procedure is truly a general, non-private proceeding governed by the Amendment. (Kastner-Florida)
W78-02100

MARINE POLLUTION AND THE ABSOLUTE CIVIL LIABILITY OF THE SHIPOWNER UNDER THE LAWS OF THE UNITED STATES AND EGYPT.
Howard Univ. School of Law, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-02101

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER.
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W78-02102

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPAL WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-02104

E.P.A. ENFORCEMENT, DECEMBER 1972 TO NOVEMBER 1974. AIR, WATER, PESTICIDES.
Environmental Protection Agency, Washington, DC. Office of General Counsel.
For primary bibliographic entry see Field 5G.
W78-02105

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT).
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-02106

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-02107

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA,

MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION (4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972).
Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-02108

RELLA V. BERLE (STANDARDS FOR APPROVING WELL APPLICATION FOR DEVELOPMENT OF PUBLIC WATER SUPPLY).
397 N.Y.S. 2d 227-30 (App. Div. 1977).

Descriptors: *New York, *Water wells, *Well permits, *Administrative decisions, *Water supply, Legal review, Water sources, Wells, Water table, Deep wells, Water yield, Water level, Water flow, Water supply development, Water quality control, Water levels, Gaging stations, Gages, Measurements, Water flow, Sewage disposal, Administrative agencies, Rivers, *Administrative regulation, *Procedural aspects, Public hearings, State policy.

The plaintiffs, a village and a conservation association, sought to annual a decision of the Commissioner of Environmental Conservation to approve the defendant water company's application to develop ten additional wells for a public water supply from a river along the village. The plaintiffs argued that the Commissioner's decision did not meet the requirements of substantial evidence when measured against statutory criteria; failed to consider alternatives to the proposal advanced by the defendant when he had an affirmative duty to seek such alternatives; and, failed to make proper findings of fact as required by law. The Supreme Court of New York, Appellate Division, affirmed the Commissioner's determination. The court found that the 'public necessity' standard of the statutes was met and the protective measures required were completely justified to insure he village an adequate water supply. In addition, state policy only required the Commissioner to determine whether the applicant had met his burden of proof and did not to place any affirmative duties on him. The court felt the Commissioner's decision revealed that he clearly and concisely evaluated the issues presented, and upon conflicting testimony, came forth with well-reasoned conclusions. (Kastner-Florida)
W78-02109

PARKER V. U.S. (ACCRETION DOCTRINE NOT APPLICABLE WHERE ORIGINAL BOUNDARIES ARE DETERMINABLE).
431 F. Supp. 226-31 (W.D. Okla. 1977).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Boundaries(Property), *Boundary disputes, Legal aspects, Adjacent land owners, Erosion, Streambeds, Judicial decisions, Riparian rights, Federal government, Land tenure, Rivers, Water rights, Water law, Real property, Non-navigable waters, *Real property law, Property.

Plaintiff landowner brought action against the United States to quiet title to certain lands, the record title to which was vested in defendant. The parties were both landowners of land north of a non-navigable river, the defendant's land being riparian and the plaintiff's land lying to the north of defendant's land. As a result of the river's slow migration northward, all of the government land and a major portion of the plaintiff's land were submerged; the river then receded, so that all of the plaintiff's land and portions of the defendant's land re-emerged. The plaintiff contended that he owned both his lands and the government lands through accretion to the center line of the river. The court re-affirmed the Oklahoma exception to the accretion doctrine, which states that where the boundaries are capable of determination, upon recession of the stream the respective landowners can claim title only to land they held before the erosion occurred. The plaintiff won favorable

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

judgment as to one tract of land but lost as to other claims by application of the exception. (Jones-Florida)
W78-02110

CHOCTAW AND CHICKASAW NATIONS V. TIBBETTS (PREVIOUSLY SUBMERGED LAND RESTORED TO ORIGINAL RECORD TITLE HOLDERS UNDER DOCTRINE OF RE-EMERGENCE).
430 F. Supp. 714-17 (E.D. Okla. 1976).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Avulsion, *Boundaries(Property), Boundary disputes, Indian reservation, Adjacent land owners, Erosion, Streambeds, Riparian rights, Water law, Judicial decisions, Land tenure, Legal aspects, Rivers, Real property, *Real property law, *Property.

The plaintiffs and defendants were landowner of adjacent property with the plaintiff's tribal lands being located in the western portion of Lots 1 and 2 and the defendants' land located in the eastern portions of the same lots. Before 1927 the Arkansas River had moved by accretion to the east, submerging the land of both parties. By the avulsive movement of the river in 1927, all of the land re-emerged. The parties stipulated that the boundaries of their lands were capable of determination. Although each party originally claimed ownership to all of the land in question under the principle of accretion, these claims were waived and the court was requested to quiet the title of each party in and to the lands they respectively held before the accretion. The United States District Court applied the Oklahoma doctrine of re-emergence which restored title to the original record title holders if the boundaries were capable of determination after the re-emergence of the land whether by avulsion or accretion. Judgment was entered according to the parties' request. (Jones-Florida)
W78-02111

LUPPOLD V. LEWIS.
563 P.2d 538-46 (Mont. 1977).

Descriptors: *Montana, *Irrigation, *Water allocation(Policy), *Water rights, *Streams, Administrative agencies, Irrigation practices, Irrigation water, Tributaries, State governments, Water control, Diversion, Diversion structures, Water delivery, Water law, Water management(Applied), Water distribution(Applied), Water users, Preferences(Water rights), Adjudication procedure, Administrative regulation, State policy.

Plaintiff water users sought clarification of a water right decree involving Four Mile Creek, a stream that sometimes flows into the North Fork of Smith River. The river is administered by a water commissioner. The plaintiffs contended that the creek was adjudged in an 1890 water rights decree so that the commissioner has authority to distribute its waters. In order to interfere with the water commissioner's management of creek water, the defendants locked and rendered inoperable headgate controls on diversions from the creek. The Supreme Court of Montana found that the 1890 decree was uncertain and susceptible of different interpretations. However, the court held that there was substantial evidence that Four Mile Creek was included in the 1890 decree because some of the land described in the decree could only be irrigated from the creek. The court also held that under the 1890 decree the creek was a tributary of the river and, therefore, governed by the decree. The water commissioner was given control of the creek to distribute the water under the rights assigned by the 1890 decree. (Jordan-Florida)
W78-02112

MIMBRES VALLEY IRRIGATION COMPANY V. SALOPEK.
564 P.2d 615-19 (N. Mex. 1977).

Descriptors: *New Mexico, *National forests, *Recreation, *Reservation doctrine, *Water rights, Preferences(Water rights), Water law, Water management(Applied), Water policy, Water users, Watercourses, Judicial decisions, Water demand, Recreation demand, Federal government, State government, Streamflow, Water utilization, Priorities, Water allocation(Policy), Water control, Water distribution(Applied), *Minimum in-stream flow, Instream uses, Land use controls, Property interest.

This suit was originally filed as a private action to enjoin alleged illegal diversion of the Rio Mimbres which flows through the Gila National Forest. The state of New Mexico was allowed to intervene and the suit proceeded as a general statutory adjudication of all the water rights on the stream system. Among the named defendants was the United States which claimed reserved water rights within the Gila National Forest for minimum in-stream flows and for recreational purposes. United States argued that when the federal government reserves land, by implication it reserves the water rights sufficient to accomplish the purposes of the reservation. The plaintiffs contended that the reservation doctrine is limited to the purposes for which the reservation was created. The New Mexico Supreme Court rejected the United States' argument that recreation had always been an integral purpose of national forests. The court held that the original purpose of Gila National Forest was to ensure favorable conditions of water flow and to furnish a continuous supply of timber. The court denied the United States' claim for minimum in-stream flows and recreational purposes. (Jordan-Florida)
W78-02113

UNITED STATES STEEL CORP. V. TRAIN (EFFLUENT LIMITATIONS ON NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
556 F.2d 822-55 (7th Cir. 1977).

Descriptors: *Industrial wastes, *Chemical wastes, *Effluents, *Waste water treatment, State jurisdiction, Standards, Water quality standards, Administrative agencies, Technology, Water pollution sources, Industrial plants, Acidic water, Industrial water, Thermal pollution, Pollution abatement, Indiana, Oil, Phenols, Water pollution, Pollutant identification, Chemicals, Injection wells, Waste disposal wells, Jurisdiction, *National Pollution Discharge Elimination System, *Effluent limitations, *Environmental Protection Agency, Point source(Pollution), Effluent guidelines, Best Possible Technology, Steel industry, Total suspended solids.

Plaintiff steel company sought review of an Environmental Protection Agency (EPA) order granting a National Pollution Discharge Elimination System (NPDES) permit. The company challenged the conditions imposed by the permit. The permit imposed technology-based limitations governing pH, total suspended solids (TSS), oil and grease at each individual outfall. Other limitations, based on state water quality standards, were imposed on thermal discharge and on six chemicals. The permit also restricted discharge of acid wastes to a deep waste-injection well and required monitoring of such discharges. The plaintiff argued that the state limitations were invalid and impossible to achieve with present technology and that the federal effluent limitations were not based on the Best Possible Technology (BPT) available. The plaintiff also challenged the EPA's authority to regulate deep-well injection. The Seventh Circuit Court of Appeals affirmed the validity of the NPDES permit. In a lengthy opinion the court held that a state may require water pollution standards more stringent than federal standards, that state

effluent limitations need not be technology-based, that the federal effluent limitations were within the BPT limits, and that the EPA has deep well injection jurisdiction. (Curran-Florida)
W78-02114

RYAN V. COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES (FORMER LESSEE REQUIRED TO ABATE NUISANCE CREATED DURING TENANCY).
373 A.2d 475-78 (Pa. Commonwealth, 1977).

Descriptors: *Solid wastes, *Public health, *Leachate, *Landfills, *Pennsylvania, Legal aspects, Leases, Land, Water pollution, Groundwater, Percolation, Water law, Permits, Penalties(Legal), Third party effects, Waste disposal, Organic matter, Public rights, Environmental sanitation, *Nuisance(Legal aspects), Solid Waste Management Act, Clean Streams Law, Property, Property interests.

The former lessee of land appealed from an order of the Department of Environmental Resources which required him to abate the nuisance created by him during the lease period. The lessee had leased the land for the purpose of operating a sanitary landfill on the site but had failed to obtain the necessary authorization for such a project. The landfill evidently did not conform to solid waste disposal regulations and created a public health hazard. The lessee contended that the Department lacked the power to issue such an order since the Solid Waste Management Act covered orders directed only to present landowners or land occupiers. He also insisted that the Department could not act under the Administrative Code of 1929 since the landfill was not a nuisance. The Commonwealth Court of Pennsylvania held that the Department had the power to issue the order under the Administrative Code since the discharge of leachate into groundwater constituted a nuisance under the Clean Streams Law and the present landowner consented to the Department's action. (Quarles-Florida)
W78-02115

BARRY V. GRELA (RIGHT TO USE PRIVATE LAND FOR ACCESS TO PUBLIC JETTY FOR FISHING).
361 N.E. 1251-52 (Mass. 1977).

Descriptors: *Massachusetts, *Boundaries(Property), *Public access, *Fishing, Public rights, Land tenure, Jetties, Legal aspects, Boundary disputes, Adjacent landowners, Recreation, High water mark, Low water mark, Coastal structures, Engineering structures, Harbors, Easements, Intertidal areas, Mud flats, Beaches, *Property interests, Real property law.

The plaintiff and defendants own land fronting on a harbor. A public jetty extends from the beach on the defendants' land into the water. The defendants do not claim to own the jetty. The plaintiffs brought suit to establish their right to cross the defendants' beach between the mean high water mark and mean low water mark to enable them to reach the jetty for fishing. The previous owner of the land had allowed this access, but the defendants have refused to permit it since they acquired the property. The Supreme Judicial Court of Massachusetts upheld the plaintiff's right to use the land between the high and low water marks as part of the 'free fish and fowling' granted by the colonial ordinance of 1641-1647. Although in previous cases based on that ordinance, the fishing was done on the flats of the complaining owner by people who came by boat, the court held that the same principle would apply to access over flats on foot on property of others so long as the purpose is fishing. (Maass-Florida)
W78-02116

WATER RESOURCES PLANNING—Field 6

Ecologic Impact Of Water Development—Group 6G

COASTAL FACILITIES REVIEW ACT.

Md. Code Ann. secs 6-501 thru 6-511 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Permits, *Coastal structures, Comprehensive planning, State governments, Environmental effects, Economic impact, Industrial production, Coastal engineering, Natural resources, Engineering structures, Pipelines, Fossil fuels, Planning, Project planning, Local governments, Construction, Economics, Cost-benefit analysis, Administrative agencies, Regulation, Oil industry, Facilities, Mineral industry, Environmental policy, State policy, Licenses, Coastal Zone Management Act of 1972, *Coastal zone management, Coastal zone, Environmental Impact Statement, Marine resources, Minerals, Procedural aspects, State interests, Environmental law, Mineral resources.

Pursuant to the Federal Coastal Zone Management Act, Maryland is establishing a plan to govern the development of the mineral resources along the State's coastal areas in order to protect the State's environmental and economic interests. As part of that plan, permits from the State's Department of Natural Resources, are required before coastal industrial facilities may be constructed. A permit application should include a complete project description. After receipt of the application the Department must prepare an environmental and economic impact statement. After at least one public hearing on the statement has been held, the permit shall either be granted, granted conditionally or denied by the Secretary of the Department if the facility meets specific statutory criteria. A provision is made for judicial review of the Department's permit action. The Department is required to inspect the facilities periodically to see that the terms of the permit are being met. Penalties are established for violations of the statute. (Malfatto-Florida)
W78-02117

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-02119

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-02120

6F. Nonstructural Alternatives

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
John Hopkins Univ., Baltimore, MD.
M. G. Wolman.
Natural Resources Journal, Vol. 16, No. 4, p. 773-89, October 1976.

Descriptors: *Water resources development, *Decision making, *Alternative planning, *Project planning, Non-structural alternatives, Flood control, Water policy, Political aspects, River basin development, State governments, Damsites, Conservation, Land use, Local governments, Planning, Reservoirs, Legal aspects, Cost-benefit analysis, Environmental effects, Coordination, Colorado River Basin, Flood plain zoning, Potomac River, *Environmental policy, Dam effects, Corps of Engineers, State policy, National Environmental Policy Act, Private interest groups.

Although water resource management planners have reacted enthusiastically to the consideration of alternatives, such a concept is not without

problems. The more alternatives and participants in a decision-making process, the more likelihood there is for ineffective or inactive decision-making. The author urges analysts to examine the rules and the agenda proposed in any water resource management decision making. Because all possible alternatives can never effectively be considered, those alternatives normally selected usually reflect the values or biases of those responsible for the inquiry. To expand the policy alternatives and to inject new ideas, will require the inclusion of new interest groups on the agenda. By expanding conflicting views, the range of political options may improve decision-making. The author presents examples in which a broader-based decision-making process has resulted in better water resource plans. (Cocheu-Florida)
W78-01737

6G. Ecologic Impact Of Water Development

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE,
Sylvester Underseas Inspection, Rockland, MA.
For primary bibliographic entry see Field 5C.
W78-01714

FORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT),
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01722

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-01729

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CARACAS SESSION AND ITS AFTERMATH,
American Society of International Law, Washington, DC. International Law and Relations Subcommittee.
For primary bibliographic entry see Field 6E.
W78-01740

ENVIRONMENTAL DEFENSE FUND V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENTS AS A BASIS FOR CONGRESSIONAL DECISIONS),
For primary bibliographic entry see Field 6E.
W78-01761

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-01769

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,
Development and Resources Corp., Sacramento, CA.
F. H. Bollman.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 95-120, 9 fig, 4 tab, 48 ref, 2 append.

Descriptors: *Estuaries, Estuarine fishery, *Habitats, *Water pollution effects, Land use, Baseline studies, Resources development, Environmental effects.

Two broad sources of degradation of fishery habitats are foreseen as resulting from population growth and economic development. Direct pollution of nutrients and toxic materials is the first source. The physical alterations are the second source. Three intensifications of use are identified as compounding the difficulty of maintaining fishery resources in estuaries: (1) increasing loads of municipal and industrial wastes; (2) the leakage of petroleum and petroleum products into estuaries; and (3) upstream activities affecting freshwater inflows. Land and water use in the coastal zone is interrelated with that in the hinterland. There is an urgent need to improve environmental impact statements so that the full extent of the values is displayed for the decision makers. A major national commitment in training, research, and funding is involved in staffing state and federal agencies with the economic and biological expertise necessary for the informed management of the nation's estuaries. (Sinha-OEIS)
W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,
East Carolina Univ., Greenville, NC.
For primary bibliographic entry see Field 5G.
W78-01772

STATUS OF ESTUARINE ECOSYSTEMS IN RELATION TO SPORTFISH RESOURCES,
Conservation Foundation, Washington, DC.
J. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 139-147, 3 fig, 3 tab, 23 ref.

Descriptors: *Estuaries, *Ecosystems, *Estuarine fisheries, Sport fishing, Resources, Coastal zone.

Increasing numbers of anglers—ten million at this time—fish along the coastal shores, an estimated 57 percent of them in the estuaries. Factors affecting the ecosystem are discussed. Recommendations are made to meet management needs, on the federal, state, and local levels. (Sinha-OEIS)
W78-01773

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,
Living Marine Resources, Inc., San Diego, CA.
For primary bibliographic entry see Field 2L.
W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01776

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING,
Espey, Huston and Associates, Inc., Austin, TX.

Field 6—WATER RESOURCES PLANNING

Group 6G—Ecologic Impact Of Water Development

For primary bibliographic entry see Field 5G.
W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES,
American Univ., Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5G.
W78-01782

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W78-01786

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS,
Maryland Univ., Solomons.
For primary bibliographic entry see Field 5G.
W78-01789

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS,
Ecological Analysts, Inc., Baltimore, MD.
For primary bibliographic entry see Field 5G.
W78-01790

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 5G.
W78-01791

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,
American Petroleum Inst., Washington, DC.
For primary bibliographic entry see Field 5B.
W78-01799

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION,
University of West Florida, Pensacola.
For primary bibliographic entry see Field 2L.
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARY PROTECTION,
Public Relations Consultant, Corpus Christi, TX.
For primary bibliographic entry see Field 5G.
W78-01809

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION,
University of the Pacific, Dillon Beach, CA.
Pacific Marine Station.
For primary bibliographic entry see Field 5G.
W78-01819

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
For primary bibliographic entry see Field 5C.
W78-01820

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W78-01822

THE BIOLOGY OF BARBERSPAN, WITH SPECIAL REFERENCE TO THE AVIFAUNA,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
P. le S. Milstein.
The Ostrich, Supplement 10, p 3-25 and 72, 74, 1975. 11 fig, 5 tab, 39 ref.

Descriptors: *Water birds, Nature conservation, Aquatic ecosystems, Climatology, Ecological studies, Primary production, Lentic environment, Zooplankton, Phytoplankton, Mollusks, Lakes, *Barberspan, *Arthropoda, *South Africa, *Alkaline lakes.

Barberspan is a shallow alkaline lake in the Western Transvaal. The surrounding countryside was grassveld, now largely under the plough, with relic patches of Kalahari Thornveld. Due to a far-sighted diversion in 1918 of the Harts River into its fossil course, the pan is locally unique in having permanent water. This factor and its large area when full of over 1 700 ha have contributed to its importance to birds. One of the only two official bird-ringing stations in Southern Africa was established at Barberspan. From 1955 to 1970 inclusive, at least 61 920 birds of 164 species were ringed, mainly waterfowl. In view of extensive reorganization begun in 1968, this paper attempts to consolidate previous data on Barberspan. A better ecological background for current long-term research is supplied. The recorded avifauna of 320 species has been brought up to date until the end of 1970. To those previously published, 71 species have been added. Breeding data received only passing reference, but the highlight was the first recorded Transvaal breeding of the Caspian Tern *Sterna caspia* in 1968. Aspects of bird management at Barberspan have been incorporated. Due to a current more specialized study with all the Barberspan waterfowl data now computerized, only some diagrams of movements in better-represented species are presented. Some recorded avian extoparasites are recorded. (So. African Water Info Center)
W78-01832

RELATIVE ABUNDANCE OF WATERFOWL IN THE ORANGE FREE STATE,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Nature Conservation.
J. N. Geldenhuys.
The Ostrich, Vol 47, No 1, p 27-54, March 1976. 23 fig, 16 ref.

Descriptors: *Water birds, Aquatic ecosystems, Population studies, Food chains, Breeding, Dams, Reservoirs, Pans, Species distribution, *Ducks, *Orange Free State, *South Africa.

During 1971-1972 a census was conducted in the Orange Free State, Republic of South Africa, to investigate the relative abundance of duck species. The survey was carried out in both the wet and dry seasons. The results are presented by plotting seasonal distribution within quarter degree squares and classifying all records for each species into group size classes. Comparisons are made of total numbers, frequencies of occurrence and seasonal habitat utilization. Overall abundance, ar-

ranged according to percentages of the total duck population, was as follows: Rare to uncommon (smaller than 1%) - White faced Duck, Whistling Duck, Hottentot Teal, Maccoa Duck, Black Duck, White backed Duck and Knob-billed Duck; common (4-9%) - Cape Teal, Cape Shoveller, Southern Pochard, Red-billed Teal and Spurwinged Goose; very common (19-20%) - Yellow-billed Duck and South African Shelduck; abundant (32%) - Egyptian Goose. (So African Water Info Center)
W78-01843

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAL SUMMARY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II INDUSTRY PRIORITY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III IRON AND STEEL INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV PETROLEUM REFINING INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V PULP AND PAPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI OLEFINS INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII AMMONIA INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII ALUMINA/ALUMINUM INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANU-

FACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01901

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI. GLASS INDUSTRY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01902

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII. PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01905

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING.
Lamont-Doherty Geological Observatory, Palisades, NY.
R. Gerard.
Marine Technology Society Journal, Vol. 10, No. 7, p 7-16, September 1976. 2 tab, 5 fig, 49 ref. NSF IDO-72-06424.

Descriptors: *Mining, *Manganese, *Environmental effects, Mining engineering, Pacific Ocean, Oceans, Water resources development, Deep water, Hydraulic systems, Dredging, Copper, Nickel, Cobalt, International law, International waters, Bottom sediments, Turbidity, Sediment-water interfaces, *Deep-sea mining, *Manganese nodules, Continuous-line bucket dredging, Airlift-hydraulic dredging.

Manganese nodules on the ocean floor will probably be exploited commercially before 1980 for their nickel, copper, and cobalt content. The eastern equatorial north Pacific nodule zone is the only area of economic interest, where bottom coverage is a minimum of 30-35%, the wet weight concentration is at least 5 kg/sq m, and in the richest sector (east of 150 west longitude) nodules average 1.28% nickel, 1.16% copper, and 0.23% cobalt. The only environmental threat of exploratory activities would be sediment disturbance by dredge sampling to a depth of 0.5 m; significant damage is unlikely. Two mining systems are under development: (1) the continuous-line bucket (CLB) dredge, which consists of a moving loop of synthetic rope extending from surface ship to

ocean floor, to which are attached open mesh metal buckets every 20-50 m; (2) the airlift hydraulic (AL) system, employing a pipe extending from ship to sea floor attached to a dredge head with jets, harrow blades, and rake. Both systems are likely to result in: (1) disturbance or destruction of benthic organisms, with mixing and resuspension of sediments by the dredge; (2) resettlement of disturbed sediment, posing a danger to benthic animals; and (3) alteration of bottom water chemistry. The CLB system will probably add to water column turbidity, while discharge by the AL system of bottom water into surface water will transfer rich nutrients and organisms to the surface, and probably also alter light penetration with the turbid discharge. (Lynch-Wisconsin)
W78-01908

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY.
Massachusetts Univ., Boston. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01952

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8B.
W78-01973

JOINT USE OF INTERNATIONAL WATER RESOURCES.
Mahart, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W78-02010

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS).
For primary bibliographic entry see Field 5G.
W78-02099

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER.
Stanford Univ., CA. Dept. of Civil Engineering.
J. Randolph, and L. Ortolano.
Environmental Affairs, Vol 5, No 2, p 213-53, Spring 1976. 1 fig, 1 tab.

Descriptors: *Environmental effects, *Legislation, *Alternative planning, *Administrative decisions, Natural resources, River basins, Planning, Decision making, Comprehensive planning, River basin commissions, Project planning, Investigations, Water resource development, Engineering, Coordination, Project post-evaluation, Water management, Wildlife, Fish, Multiple-purpose projects, Water supply, Flood control, Dams, *Environmental impact statement, *National Environmental Policy Act (NEPA), Corps of Engineers, Environmental policy.

The legislative history and statutory language of the 1969 National Environmental Policy Act (NEPA) indicate that its intent is to require federal agencies to consider environmental factors in all agency planning and decision-making. The influence of NEPA on early planning decisions, as well as the formulation and ranking of alternative actions, was assessed in the Carmel River Basin survey conducted by the Corps of Engineers. The problems investigated by the Corps included insufficient water supply for the growing population and flooding of residential and commercial developments in the flood plain. The Corps conducted environmental studies and proposed al-

ternate solutions in a working paper. Then, the 102 process the events leading up to the drafting of an environmental impact statement, began. Although NEPA has some influence on the river survey, the effectiveness of the 102 process in forcing planners to consider environmental factors in decision-making depends on the quality of information produced, the time the information is put into the planning process, and the extent of integration of information with the decisions. The 102 process in this survey was deficient in all three areas. (Mass-Florida)
W78-02102

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-02107

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Land Management, Washington, DC.
(1975). 1,039 p.

Descriptors: *Environmental effects, *Oil fields, *Continental shelf, *Leases, *Drilling, Offshore platforms, Oceans, Exploration, Oil industry, Oil spills, Natural gas, Gases, Cost-benefit analysis, Economics, Marine fish, Resources, Recreation, Exploitation, Commercial fishing, Navigation, Beaches, Sites, *Environmental impact statement, *Outer Continental Shelf, *Coastal zones, *Marine ecosystems, Marine resources, Marine environment.

The purpose of this Final Environmental Impact Statement (EIS) is to identify the impacts on the natural environment and the various coastal zone resources, on air and water quality, on land use patterns and on the social order which might result from the proposed acceleration of Outer Continental Shelf (OCS) oil and gas leasing. The EIS does not deal with specific leasing sites but discusses in general terms the sources of impact-generating effluents upon broad groups of resources. The environmental impacts discussed include the natural phenomena in each OCS area and their impact generating potential, major oil spills and the marine environment, generic impacts, impacts not specific to regions and cumulative impacts. Unavoidable adverse impacts discussed include impacts on air and marine quality, interference with navigation and fishing, interference with recreational activities and the degradation of aesthetic values. Suggested alternatives to the proposed action include: no action; reducing the rate of OCS leasing; halting OCS leasing; alternative lease bidding systems; postponing the leasing decision until a national energy plan is developed; and energy conservation. The environmental impacts associated with alternative fuel sources are also considered. (Curran-Florida)
W78-02120

BIOLOGICAL INTEGRITY—1975,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
G. M. Woodwell.
Report No BNL 19929. (1975) 10 p, 1 fig, 1 ref.

Descriptors: *Ethics, *Succession, Water quality control, Pollution abatement, New York, Nutrients, Forests, Agriculture, Social change, Social aspects, Seres, Long Island (NY).

A paper dealing with ethics and other philosophical aspects of societal control of water quality management and pollution control contends that

Field 6—WATER RESOURCES PLANNING

Group 6G—Ecologic Impact Of Water Development

compromise among competing exploiters is not a sufficient basis for management of the nation's waters. Science can help by emphasizing its two new most basic principles, evolution and succession. The generalized effect of human activities is to shift both terrestrial and aquatic systems from successional mature stages to less mature managed stages. The flux of nutrients along a sere in central Long Island (NY), from agriculture to oak-pine forest, is examined in a study included in this paper. The quantity of nutrient ions entering the ground water under the various communities of the sere were measured. Two trends were conspicuous. First, for most of the ecosystems the effect was to increase the flux of most ions over that in precipitation. Second, the fluxes out of these systems were substantially higher in the least mature successional systems and lowest in later forest stages. The primary challenge of management is to build closed urban and agricultural systems that mimic in their exchanges with the rest of the environment that mature natural systems they displaced. (Lynch-Wisconsin)

W78-02184

7. RESOURCES DATA

7A. Network Design

MODEL STATE WATER MONITORING PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
For primary bibliographic entry see Field 5A.
W78-01855

SAMPLING ERRORS IN THE MEASUREMENT OF RAIN AND HAIL PARAMETERS.
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W78-01992

7B. Data Acquisition

DEVICE FOR MEASURING AMOUNT OF SOIL SPLASHED BY RAINDROPS, (IN RUSSIAN).
For primary bibliographic entry see Field 2G.
W78-01709

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT).
Systems International, Inc., Gambrills, MD.
P. A. Costruccio, H. L. Loats, T. R. Fowler, and S. L. Frech.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28500.
Price codes: A05 in paper copy, A01 in microfiche.
June 1975. 85 p. NASA-CR-143822, NAS5-20567.

Descriptors: *Water management(Applied), *Hydrologic data, *Research equipment, *Remote sensing, Model studies, Computers, Satellites(Artificial), Surveys, Research and development, Research facilities, Comprehensive planning, Instrumentation, Water resources development, Analytical techniques, Administrative agencies, Governments, Data collections, Universities, Local governments, Federal government, State governments.

In developing water management plans, numerous governmental and private entities utilize data acquired through remote sensing devices employed by aircraft, spacecraft, or unmanned orbiting satellites. The National Aeronautics and Space Administration's Goddard Space Flight Center has published a report on the general impact of remote sensing in the field; this document comprises twelve appendices to the report. The appendices

include: a list of the agencies and private firms surveyed; separate listings of the hydrologic models used by state and federal agencies and by private firms; a summary of the activities and budgets of the eleven major federal water resources research agencies; summaries of the water resources activities of universities and of state and local governments according to the percentage of time devoted to different areas of research; and a listing of the computers used by each entity, indicating total use and percentage of total utilization for water resource activities. (See also W76-08536) (Sloan-Florida)
W78-01739

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 2L.
W78-01834

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-01875

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY,
Old Dominion Univ. Research Foundation, Norfolk, VA.
For primary bibliographic entry see Field 5A.
W78-01946

LASER ABSORPTION TECHNIQUES FOR THE MEASUREMENT OF ATMOSPHERIC WATER VAPOR CONCENTRATION,
University of Western Ontario, London. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W78-01997

TOTAL WATER CONTENT INSTRUMENT,
Office of the Secretary (Air Force), Washington, DC. (Assignee).
R. G. Hooper.
U.S. Patent No. 4,031,753, 4 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1481, June 28, 1977.

Descriptors: *Patents, *Sampling, *Water sampling, *Moisture content, *Meteoric water, Precipitable water, Atmosphere, Monitoring, Measurement, Electrical equipment.

This invention is concerned with providing a total water content instrument suitable for continuously giving an electrical output response that is directly proportional to the total percentage water content of a sample solid or liquid water particles in a sample area of the atmosphere. The sample areas can be associated with clouds of either liquid water, ice, or snow as well as areas of precipitation not necessarily defined by clouds. A large funnel shaped scoop with the wide end facing forward allows high volume collection of particles at nominal aircraft speeds. The time lag for routing of water into the detection device is around 12 seconds. The detection device is a concentric flow-through capacitor which varies in capacitance according to the dielectric of the fluid enclosed. It is therefore the object of the invention to provide an instrument capable of real-time monitoring of total water content in the atmosphere. (Sinha - OEIS)
W78-02140

AERIAL MONITORING EXPERIENCE,
Environmental Protection Agency, Edison, NJ. Region II.
For primary bibliographic entry see Field 5A.
W78-02167

CONTINUOUS MONITORING BB ION SELECTIVE ELECTRODES,
Pittsburg Univ., PA. Graduate School of Public Health.
For primary bibliographic entry see Field 5A.
W78-02168

LIDAR FOR REMOTE MONITORING,
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-02169

ENVIRONMENTAL KEYS FOR OIL AND HAZARDOUS MATERIALS,
McDonnell Aircraft Co., St. Louis, MO.
For primary bibliographic entry see Field 5A.
W78-02170

DETECTION OF DISSOLVED OXYGEN IN WATER THROUGH REMOTE SENSING TECHNIQUES,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5A.
W78-02171

SCOPE OF RESEARCH NEEDS,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-02172

SINGLE WAVELENGTH FLUORESCENCE EXCITATION FOR ON-SITE OIL SPILL IDENTIFICATION,
For primary bibliographic entry see Field 5A.
W78-02173

REMOTE MONITORING IN REGION VI,
Environmental Protection Agency, Dallas, TX. Region VI.
For primary bibliographic entry see Field 5A.
W78-02174

REGION III'S REPRESENTATIVE REPORT,
Environmental Protection Agency, Philadelphia, PA. Region III.
For primary bibliographic entry see Field 5A.
W78-02175

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5G.
W78-02176

REGION IV ENVIRONMENTAL MONITORING EQUIPMENT,
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5A.
W78-02177

REMARKS, REGION IX,
Environmental Protection Agency, San Francisco, CA. Region IX.
For primary bibliographic entry see Field 5A.
W78-02178

RESOURCES DATA—Field 7

Evaluation, Processing and Publication—Group 7C

REMARKS, REGION VIII.
Environmental Protection Agency, Denver, CO.
Region VIII.
For primary bibliographic entry see Field 5A.
W78-02179

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES.
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 3F.
W78-02185

7C. Evaluation, Processing and Publication

DEVELOPMENT OF HATREMS DATA BASE AND EMISSION INVENTORY EVALUATION.
Midwest Research Inst. Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-01856

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX).
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 77-708, 1977. 7 p, 1 ref.

Descriptors: *Data storage and retrieval, *Data transmission, *Information exchange, *Water resources, *Methodology, *Organizations, *Programs, *Operations, *National Water Data Exchange, *NAWDEX, *Program management, *Master water data index, *Water data sources directory.

The National Water Data Exchange (NAWDEX) has been established as a nationwide program directed at improving access to water and water-related data and disseminating information about the availability of these data throughout the entire water-resources community. NAWDEX is composed of a confederation of water-oriented organizations working together to facilitate the exchange of data and to improve the technology of data handling and transfer. This report is intended to provide guidelines to assure that all member organizations participate equally and that a climate of cooperation and open communication is established among participating members.
(Woodard-USGS)
W78-01860

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01863

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA.
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01864

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO.
Geological Survey, Albuquerque, NM. Water Resources Div.
G. E. Welder.
Open-file report 77-505, 1977. 1 sheet.

Descriptors: *Water table, *Groundwater, *Aquifers, *Maps, *New Mexico, *Altitude, *Depth, *Water levels, *Water-table gradient, *Roswell basin(N Mex), *Chaves County, *Eddy County.

The altitude and gradient of the water table in the 'shallow aquifer' of the Roswell basin in Chaves and Eddy Counties, New Mexico, for January 1975 is shown on a map, scale of 1/2-inch per mile. The map was prepared by the U.S. Geological Survey in cooperation with the New Mexico State Engineer Office. (Woodard-USGS)
W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO.
Geological Survey, Albuquerque, NM. Water Resources Div.
G. E. Welder.
Open-file report 77-506, 1977. 1 sheet.

Descriptors: *Water table, *Groundwater, *Aquifers, *Maps, *New Mexico, *Altitude, *Depth, *Water levels, *Water-table gradient, *Roswell basin(N Mex), *Chaves County, *Eddy County.

The altitude and gradient of the water table in the 'shallow aquifer' of the Roswell basin in Chaves and Eddy Counties, New Mexico, for January 1964 is shown on a map, scale of 1/2-inch per mile. The map was prepared by the U.S. Geological Survey in cooperation with the New Mexico State Engineer Office. (Woodard-USGS)
W78-01868

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01872

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975.
Geological Survey, Houston, TX. Water Resources Div.
C. E. Ranzau, Jr.
Open-file report 77-274, June 1977. 306 p, 20 fig, 15 tab, 3 ref.

Descriptors: *Rainfall-runoff relationships, *Storm runoff, *Urban runoff, *Urban hydrology, *River basins, *Streamflow, *Flow rates, *Hydrographs, *Mass curves, *Basic data collections, *Houston area(Tex).

Detailed rainfall-runoff computations, including hydrographs and mass curves, are presented for nine storm periods during the 1975 water year in drainage basins in the Houston, Texas metropolitan area. The information will be useful in determining the extent to which progressive urbanization will affect the yield and mode of occurrence of storm runoff. (Woodard-USGS)
W78-01873

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
Water-Data Report MI-76-1, June 1977. 615 p, 9 fig.

Descriptors: *Michigan, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Gaging stations, *Streamflow, *Flow rates, *Sediment transport, *Water analysis, *Water tempera-

ture, *Chemical analysis, *Lakes, *Reservoirs, *Water wells, *Water levels, *Data collections, *Sites.

Water resources data for the 1976 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 194 gaging stations, stage and contents for 5 lakes and reservoirs, water quality for 75 continuous-record stations, 28 partial-record stations and 5 lakes, and water levels for 27 observations wells. Also included are 88 crest-stage partial-record stations and 33 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Michigan. (Woodard-USGS)
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 296. Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report NJ-76-1, June 1977. 766 p, 9 fig, 5 tab, 30 ref.

Descriptors: *New Jersey, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Gaging stations, *Streamflow, *Flow rates, *Sediment transport, *Water analysis, *Water temperature, *Chemical analysis, *Lakes, *Reservoirs, *Water wells, *Water levels, *Data collections, *Sites.

Water resources data for the 1976 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 83 gaging stations; tide summaries for 9 stations; stage and contents for 31 lakes and reservoirs; water quality for 25 gaging stations, 213 partial-record flow stations, and 118 wells; and water levels for 3 observation wells. Also included are 90 crest-stage partial-record stations and 70 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Jersey. (Woodard-USGS)
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 772. Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report VA-76-1, September 1977. 363 p, 4 fig.

Descriptors: *Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Gaging stations, *Streamflow, *Flow rates, *Sediment transport, *Water analysis, *Water temperature, *Chemical analysis, *Lakes, *Reservoirs, *Water wells, *Water levels, *Data collections, *Sites.

Water resources data for the 1976 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report contains discharge records for 196 gaging

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

stations; stage only for 1 gaging station; stage and contents for 9 lakes and reservoirs; water quality for 31 gaging stations; and water levels for 56 observation wells. Also included are data for 117 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Virginia. (Woodard-USGS) W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.

Geological Survey, Honolulu, HI. Water Resources Div. Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 565, Price codes: A20 in paper copy, A01 in microfiche. Water-Data Report HI-76-1, April 1977. 445 p, 26 fig, 1 tab.

Descriptors: *Hawaii, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Mariana Islands, *Caroline Islands, *Samoa Islands.

Water resources data for the 1976 water year for Hawaii and other Pacific areas consist of records of stage, discharge, and water quality of streams; stage of a reservoir; and water levels and water quality in wells and springs. This report contains discharge records for 158 gaging stations; stage only record for 1 gaging station; water quality for 10 gaging stations, 108 partial-record flow stations and 144 wells; and water levels for 25 observation wells. Also included are 107 crest-stage partial-record stations and 109 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, Territorial, and Federal agencies in Hawaii and other Pacific areas. (Woodard-USGS) W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.

Geological Survey, Boston, MA. Water Resources Div. Available from the National Technical Information Service, Springfield VA 22161 as PB-271 706, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report MA-RI-76-1, June 1977. 300 p, 5 fig.

Descriptors: *Massachusetts, *Rhode Island, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1976 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 109 gaging stations, monthend contents for 15 lakes and reservoirs, water quality for 23 gaging stations, and water levels for 44 observation wells. Also included are data for 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements.

A few pertinent stations in bordering States are also included. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Massachusetts and Rhode Island. (Woodard-USGS) W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.

Geological Survey, Portland, OR Water Resources Div. Water-Resources Investigations in Oregon Folder, 1977. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Oregon, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Groundwater, Water quality, On-site investigations, Lakes, Reservoirs, Precipitation(Atmospheric), Networks, *Maps, *Bibliographies, Cooperative water-studies program.

Water-resources studies and investigations in Oregon made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; ground water observation wells; and water-quality observation sites. Small State maps show average annual precipitation, flood prone areas, and inventory of lakes and reservoirs, principal sources of ground water, and discharge of principal rivers. A map, scale 30 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Oregon as of January 1977. (Woodard-USGS) W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.

Geological Survey, Denver, CO Water Resources Div. Available from U.S. Geological Survey, Denver, CO 80203. Water-Resources Investigations in Colorado Folder, 1977. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *Colorado, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation(Atmospheric), Streamflow, Runoff, Groundwater availability, Water quality, Dissolved solids, *Bibliographies, Networks, *Maps, U.S. Geological Survey, Cooperative water-studies program.

Water-resources investigations in Colorado in which the U.S. Geological Survey participates are summarized. A bibliography of pertinent reports is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; ground-water observation wells; and water-quality observation sites. Small State maps show principal sources of ground water, mean annual precipitation, discharge of the principal rivers, dissolved solids concentrations in rivers, and chemical type of water in rivers. A map, scale 50 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Colorado as of January 1977. (Woodard-USGS) W78-01882

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS), Arthur D. Little, Inc., Cambridge, MA.

For primary bibliographic entry see Field 5A. W78-01887

8. ENGINEERING WORKS

8B. Hydraulics

OFFSHORE ISLANDS,

Harris (Frederick R.), Inc., New York. E. H. Harlow. Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of ASCE, Vol 103, No WW1, Proc. Paper 12754, p 137-158, February 1977. 7 fig, 68 ref.

Descriptors: *Transportation, *Environmental effects, *Resources development, *Offshore platforms, Defense, Structures, Economics, *Outer Continental Shelf, *Artificial islands.

The sociological and environmental aspects of the construction of artificial islands on the outer continental shelf are considered. The reasons for and functions of such islands are explained. Brief remarks are made on their construction and maintenance, on economics, institutional aspects, financing and risks. Finally the need for environmental planning is examined. The potential of offshore islands is both real and challenging. With suitable research, the civil engineering design questions seem to be susceptible to reasonable answers. The economics for specific sites and purposes will have to be established by comparison with alternative land-based sites. But the legal and institutional framework for new land made out of the sea remains shrouded in a puzzle as impenetrable as a maritime fog. (Sinha-OEIS) W78-01704

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,

Kentucky Water Resources Research Inst., Lexington. For primary bibliographic entry see Field 4D. W78-01823

PLUMBING AND DRAINAGE IN TALL BUILDINGS,

National Building Research Inst., Pretoria (South Africa). P. R. Crabtree. Municipal Engineer, Vol 7, No 2, p 97-106, March 1976.

Descriptors: *Plumbing, *Drainage systems, *High buildings, Water supply, Decision making, Research and development, Design criteria, Health aspects, Water storage, Storage tanks, Layout, Underdrainage, Fire fighting, Rainwater, Wastes handling, Noise, Pipes, Fittings, Pressure tanks, Construction techniques, Prefabricated units, Operation and maintenance, South Africa.

Various aspects of drainage and plumbing systems for large buildings are discussed; particularly design and materials selection, problems encountered in high-rise development are highlighted. Much of the content is equally applicable to buildings of any height, and all aspects of the services involving the plumber are covered. (So African Water Info Center) W78-01846

RECONNAISSANCE OF SEDIMENTATION IN THE RIO PILCOMAYO BASIN, MAY 1975, ARGENTINA, BOLIVIA, AND PARAGUAY,

Geological Survey, Harrisburg, PA. Water Resources Div. For primary bibliographic entry see Field 2J. W78-01862

ENGINEERING WORKS—Field 8

Hydraulic Machinery—Group 8C

OUTLET WORKS AND STILLING BASIN FOR LUCKY PEAK DAM, BOISE RIVER, IDAHO; HYDRAULIC MODEL INVESTIGATION.

Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 407. Price codes: A05 in paper copy, A01 in microfiche. Report No 43-1, July 1956. 79 p, 18 fig, 7 tab, 26 plate, 21 ref, 3 append.

Descriptors: *Hydraulic models, *Hydraulics, *Outlet works, *Idaho, Spillways, Erosion, Cavitation, Prototypes, Gates, Dams, Froude number, Hydraulic structures, Model studies, Settling basins.

Identifiers: *Flip buckets, *Cavitation damage, *Boise River, Manifolds, Lift gates.

Model investigations of the outlet works and stilling basin for Lucky Peak Dam and Reservoir were conducted in 3 undistorted models. The tests were made to develop the basic design for a cavitation-free manifold and to determine the energy-dissipating facilities required to ensure satisfactory flow conditions in the river channel. The preliminary tests indicated that 6 vertical slide valves in a six-branch manifold would control all flows to and including the design discharge of 30,000 cfs as satisfactorily as the seven 102-in-diam Howell-Bunger valves originally proposed. Subsequent tests indicated a problem of cavitation pressures in and around the valve slots. The problem was not solved completely, but it appeared that damage in the prototype could be prevented by avoiding operation in the range of gate opening in which cavitation was expected. Individual curved bucket sections (flip buckets) were installed downstream from each slide valve to place the area of impact of the flow at a distance from the structure. A stilling basin was used to dissipate the energy of the falling jets. To minimize impingement of flow on the right bank, it was necessary to vary the curvature of the flip buckets and to direct the jets toward the left bank by rotating the manifold 15 degrees. (Adams-ISWS) W78-01972

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS.

Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. J. H. Johnson, R. C. Solomon, C. R. Bingham, B. K. Colbert, and W. P. Emge.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 041. Price codes: A07 in paper copy, A01 in microfiche. Technical Report Y-74-1, November 1974. 143 p, 41 fig, 15 tab, 37 ref, 2 append.

Descriptors: *Mississippi River, *Navigable rivers, *Aquatic habitats, *Channel improvement, *River training, *Wildlife habitats, *Geomorphology, Ecology, Model studies, Dredging, Fish populations, Aquatic plants, Wildlife, Flood plains, Rivers, Channel morphology.

Identifiers: Dredging spoil, Side channels.

The Mississippi River 9-ft channel project was authorized by the River and Harbor Acts of 1927 and 1930. The purpose of the project was to maintain navigation from the confluence of the Missouri River to the confluence of the Ohio River. The main channel will be contracted to 1500 ft between riverward ends of dikes throughout the area to maintain the 9-ft depth during periods of low flow. A comprehensive study of the historical geomorphology supplemented by physical models of the river and side channels was made to determine the physical impact of river contraction works on river morphology and behavior. An intensive study of the terrestrial flora and fauna was conducted to inventory the existing organisms and communities located in the unprotected floodplain and to assess the impacts of operation and main-

tenance activities. The aquatic flora and fauna were studied to inventory the aquatic communities present in the study area and to assess the importance of side channels to the riverine ecosystem. The relative biological importance of each side channel, established by ranking procedures, provided a rational choice of those side channels that could provide maximum benefit to the river's ecology. Operation and maintenance activities include maintenance dredging, disposal of dredged material, and construction and maintenance of levees, dikes, and bank revetments. The mentioned activities were examined, and the potential environmental impacts resulting therefrom were discussed. (Adams-ISWS) W78-01973

CLOSURE FILL AND SKELETON POWERHOUSE UNITS, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATIONS.

Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.

For primary bibliographic entry see Field 8D. W78-01974

THE WAVE PUMP: CONVERSION OF WAVE ENERGY TO CURRENT ENERGY.

Norges Tekniske Høgskole, Trondheim. Inst. for Anleggsdrift og Havnebygging.

For primary bibliographic entry see Field 8C. W78-01977

BUOYANT RECTANGULAR SURFACE THERMAL PLUMES.

Old Dominion Univ., Norfolk, VA School of Engineering.

For primary bibliographic entry see Field 5B. W78-01986

APPARATUS FOR PREVENTING EROSION OF THE SEABED IN FRONT OF HYDRAULIC STRUCTURES.

O. F. Larsen.

U.S. Patent No. 4,030,306, 4 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 997, June 21, 1977.

Descriptors: *Patents, *Beach erosion, *Shore protection, *Coastal structures, *Waves(Water), Ocean waves, Hydraulic structures, Deposition(Sediments).

An apparatus for and methods of preventing erosion of the seabed along vertical or steeply inclined hydraulic structures, such as seawalls, piers, jetties, quays, breakwaters, etc. are described. A slope in front of the hydraulic structure is established by means of a sloping or inclined sheet of flexible or rigid material. The hollow beneath the sheet when in place before the hydraulic structure will be filled by sediment and a stable slope is created which breaks the waves and thereby prevents erosion. The hollow space beneath the inclined sheet will fill automatically with sediment caused by wave action, but in order to speed up the process this hollow may be filled artificially by dumping in sand, gravel, rocks or the like. (Sinha-OEIS) W78-02127

8C. Hydraulic Machinery

THE UPS AND DOWNS OF STEENBRAS.

Construction in Southern Africa, Vol. 21, No. 6, p 69, 73, 76, 1976.

Descriptors: *Hydroelectric power, Electrical power, Pumps, Reservoirs, Power demand, Dams, *Pumped storage, Water schemes, Impoundments, Pumping, *South Africa, Cape Town, *Steenbras dam.

The Steenbras pumped storage plant will utilize relatively cheap off-peak power, available at night, to pump water from a lower reservoir to an upper mountain reservoir. During peak demand periods the energy thus stored will be available within minutes through the hydroelectric pumped storage system. (So African Water Ind. Center) W78-01831

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.

For primary bibliographic entry see Field 5F. W78-01833

THE WAVE PUMP: CONVERSION OF WAVE ENERGY TO CURRENT ENERGY.

Norges Tekniske Høgskole, Trondheim. Inst. for Anleggsdrift og Havnebygging.

P. Bruun, and G. Viggosson. Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13317, p 449-469, November 1977. 18 fig, 9 tab, 16 ref, 1 append.

Descriptors: *Waves(Water), *Ocean waves, *Puerto Rico, *Energy, Energy conversion, Pumps, Currents(Water), Flow, Wave pile-up, Structures, Hydraulic structures, Hydraulic models, Model studies, On-site investigations, Hydraulics.

Identifiers: *Wave pumps, Harbor flushing, Flushing mechanisms.

The Wave Pump converts wave energy to current energy utilizing the momentum of waves which are close to or at the breaking stage. To improve the efficiency of the Pump so that even smaller waves become effective, waves are concentrated in a funnel. Funnel geometry, therefore, is an important parameter. So is the wave height over depth ratio. The effectiveness of the pump is not reduced even if the direction of wave propagation deviates + or - approximately 10 deg from the centerline of the pump. The efficiency of the pump may be further improved by the installation of a ramp at the entrance to the discharge channel. The pump has been tested thoroughly by hydraulic model tests. The first prototype was built at the Palmas Del Mar marina on Puerto Rico as a flushing device in a low tidal range area. It has been in operation for approximately 2 yr. The pump also is useful for flushing of ice in arctic waters. It may be used as an energy producing device on a modest scale. (Sims-ISWS) W78-01977

PUMP STARTING SYSTEM FOR SEA THERMAL POWER PLANT.

Sea Solar Power, Inc., York, PA. (Assignee).

J. H. Anderson.

U.S. Patent No. 4,030,301, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 995, June 21, 1977.

Descriptors: *Patents, *Sea water, *Energy conversion, *Electric power plants, Electric power production, Temperature, Equipment, Turbines, Sea thermal powerplant, Temperature gradient.

In a turbine driven power generating plant of the type using a hydrocarbon or halocarbon as the working fluid operating on or near the surface of an ocean, warm surface water is used as a source of heat for a boiler and cold water pumped from substantial depths is used to condense the working fluid after it has been expanded through the turbine. An auxiliary power source for starting the water pumps of the main system includes a prime mover driving a compressor which in turn supplies a high energy working fluid to a turbine coupled to drive the water pumps. The turbine exhaust after being cooled in a heat exchanger by the cold water pumped from the ocean depths, is returned to the suction side of the compressor. (Sinha-OEIS) W78-02124

Field 8—ENGINEERING WORKS

Group 8C—Hydraulic Machinery

OCEAN TIDE AND WAVE ENERGY CONVERTER.
J. L. Conn, and G. Spector.
U.S. Patent No. 4,034,231, 5 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 407, July 5, 1977.

Descriptors: *Patents, *Wave(Water), Ocean waves, Energy conversion, Power generation, Coastal structures, Hydraulic structures, Tidal powerplants.

A machine harnesses the motion of ocean waves in order to convert the motion energy into useful electrical power. The machine consists of a large V-shaped frame, submerged near a beach and having its apex pointed away from the beach. The frame supports a series of water turbines connected to an electric generator so that incoming waves toward the beach move along the outer side of the frame while turning the turbine rotors and the outgoing waves move along the inner side of the frame to likewise influence turning the turbine rotors. (Sinha-OEIS)
W78-02156

8D. Soil Mechanics

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR GALLIANO, LOUISIANA (LAROSE TO GOLDEN MEADOW, LOUISIANA, HURRICANE PROTECTION PROJECT).
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-01861

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS.
Bureau of Mines, Spokane, WA Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W78-01884

CLOSURE FILL AND SKELETON POWERHOUSE UNITS, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 319. Price codes: A06 in paper copy, A01 in microfiche. Technical Report No 57-1, May 1965. 92 p, 10 tab, 15 photo, 37 plate, 3 ref, 3 append.

Descriptors: *Hydraulic models, *Hydraulics, *Diversion, *Rock fill, *Dam construction, *Columbia River, Hydraulic structures, Dams, Froude number, Riprap, Draft tubes, Cofferdams, Floods, Prototypes, Model studies, Powerplants. Identifiers: *Dam closure.

The result of model studies to determine quarry rock size, fill placement procedures, and powerhouse draft tube diversion capacity were reported. It was important that the diversion fill be constructed in the shortest possible time. Tests in the 1:40-scale rock fill model indicated that river closure by means of quarry rock placed in vertical lifts from floating barges or an overhead cableway was practical. A pontoon-type haul road across the powerhouse intake channel was feasible. River diversion could be accomplished by use of rocks weighing 0.5 ton maximum during river flows less than 200,000 cfs. With a 250-ft-wide closure fill, maximum bottom velocities in the model occurred when closure was from 90 to 96% completed and varied from 15 to 17 fps for river flows of 150,000 to 200,000 cfs. Superior hydraulic conditions upstream from the skeleton powerhouse units were obtained when the diversion channel was excavated to elev 60, and the left abutments of a tem-

porary cofferdam and haul road across the diversion channel were retained. Model and prototype velocities showed good agreement during the closure operation; water-surface elevations and heads on the fill varied as much as 2.3 ft. Model-prototype correlation was good after all flow was diverted through the skeleton powerhouse. Tests in the 1:25-scale model of a single skeleton unit showed that the draft tube of original design would not pass the required flow without raising the forebay above the spillway crest. The draft tube that was adopted after the model tests was satisfactory. (Adams-ISWS)
W78-01974

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01717

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO—FISCAL YEAR 1977.
Geological Survey, Lakewood, CO. Water Resources Div.
D. E. Hillier, and J. B. Weeks.
Open-file report 77-532, June 1977. 88 p, 30 fig, 1 plate, 1 tab.

Descriptors: *Water resources, *Investigations, *Colorado, *Projects, Surface waters, Groundwater, Water quality, Hydrologic data, Data collections, Water pollution sources, Coal mine wastes, River basins, Rainfall-runoff relationships, Reservoirs, Water supply, Geothermal studies, Reviews, Evaluation, *US Geological Survey, Missouri River basin, Arkansas River basin, Colorado River basin, Rio Grande basin.

Current water-resources data-collection activities in Colorado are summarized for the 1977 fiscal year. The locations of long-term data-collection stations are shown on a map of the State. Forty-three interpretive hydrologic investigations are summarized: 6 statewide investigations, 6 regional investigations, 11 investigations in the Missouri River basin, 5 investigations in the Arkansas River basin, 2 investigations in the Rio Grande basin, and 13 investigations in the Colorado River basin. The summaries of the investigations consist of a map showing the location of the area of the investigation and a brief description of the investigation's purpose, objective, approach, progress, and plans. (Woodard-USGS)
W78-01858

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E.
W78-01866

TENTH ANNUAL WATER RESOURCES RESEARCH CONFERENCE REPORT.
Office of Water Research and Technology, Washington, DC.
Report on Tenth Annual Water Resources Research Conference, April 9-10, 1975, Washington, D.C., Office of Water Research and Technology, U.S. Department of the Interior, 95 p.

Descriptors: *Conferences, *Desalination, *Information exchange, *Water resources development, Water resources, Comprehensive planning, Technical societies, Legislation, Regional development, Planning, Water purification, Research and development, Water quality control, Water quality, Water treatment, Publications, Technology, Data collections.

The theme of the Tenth Annual Water Resources Research Conference was 'Technology Transfer'. Topics considered in the four plenary sessions include: (1) the Congressional viewpoint regarding the water program, including budgeting and proposed legislation; (2) the Office of Technology Assessment, or technology transfer, designed to provide Congress with its own technical expertise; (3) the recommendations of the 1974 Water Resources Research Advisory Panel; (4) a report of the Joint Advisory Committee of the Department of the Interior and the National Association of State Universities and Land Grant Colleges; and (5) a review of the saline water conversion program, its history and current status. Remarks by regional groups and Title II contractor representatives are also included in the report. Persons from the nationwide water community, representatives concerned with saline water conversion activities, and Directors of State Water Resources Research Institutes attended the conference. Appendices to the conference report contain the conference agenda, a list of conference attendees, a directory of the staff of the Office of Water Research and Technology, and a list of state water resources research institutes. (Mulligan-Florida)
W78-02118

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDIX).
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01860

10C. Secondary Publication And Distribution

UTILIZATION OF MANGROVES: I, (IN FRENCH).
For primary bibliographic entry see Field 2H.
W78-01708

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA.
Environmental Research Lab.-Duluth, MN.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 244. Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/9-77-005, Compiled by Nichole J. Vick. March 1977. 65 p.

Descriptors: *Technical writing, *Abstracts, *Bibliographies, *Freshwater, Biology, Water pollution effects, Pollutant identification, Environmental research.

SCIENTIFIC AND TECHNICAL INFORMATION—Field 10
Specialized Information Center Services—Group 10D

This bibliography lists publications authored by personnel of the Environmental Research Laboratory-Duluth (formerly the National Water Quality Laboratory). In addition to scientific materials (journal articles, research reports, and other) published by the laboratory staff, project reports prepared by universities, industries, and other government researchers conducting studies under the funding and direction of this laboratory are listed. The publications are grouped in three sections: (1) reports published by the EPA's (and precursor agencies') research series; (2) journal articles from the scientific literature; (3) and other scientific publications. Each category is subdivided into 1976 publications (annotated) and those published from 1967 through 1975. For each year, publications are listed alphabetically by the senior author's last name, and sources of reprints are identified. Introductory materials include a list of standard abbreviations for scientific journals cited and pertinent components of the EPA and the laboratory. The bibliography concludes with an author index for all entries and a key work index for the 1976 publications. (Dorfman-IPA)
W78-01852

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.

Geological Survey, Portland, OR Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.

Geological Survey, Denver, CO Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01882

10D. Specialized Information Center Services

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX).

Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-01860

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS).

Arthur D. Little, Inc., Cambridge, MA.
For primary bibliographic entry see Field 05A.
W78-01887

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SUBJECT INDEX

1,2-PROPYLENEGLYCOLDINITRATE

Applied Polarography for Analysis of Ordnance Materials. Part 1. Determination and Monitoring of 1,2-Propyleneglycoldinitrate in Effluent Water by Single-Sweep Polarography, W78-01888 5A

2

The Ecological Effects of the Use of Dalapon and 2,4-D for Drainage Channel Management, L. Flora and Chemistry, W78-02007 5C

ABBOT'S POND (ENGLAND)

The Relationship Between Planktonic Algae and Bacteria in Small Lake, W78-01960 5C

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Abrasive Effluent, W78-02034 5D

ABSOLUTE LIABILITY

Marine Pollution and the Absolute Civil Liability of the Shipowner Under the Laws of the United States and Egypt, W78-02101 5G

ABSORPTION

Permissible Concentrations of Alcohols and Furfural in Waste Water Used for Irrigation (O Dopustimom Soderzhanii Spirtov i Furfurula v Stoknykh Vodakh, Ispol'zuemykh Dlya Orosneniya), W78-02037 5E

An Example from the Weser: Changes in the Blood Count of Fish Exposed to Higher Concentrations of Potassium (Am Beispiel der Weser: Veraenderungen im Blutbild der Fische bei hoeheren Kaliumkonzentrationen), W78-02063 5A

Competitive Inhibition for Amino Acid Uptake by the Indigenous Microflora of Upper Klamath Lake, W78-02187 5C

ABSTRACTS

Freshwater Findings 1967-1976. Research Publications of the Environmental Research Laboratory, Duluth, Minnesota. W78-01852 10C

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W78-02068	5D	W78-02147	5D		
W78-02069	5D	W78-02148	5D		
W78-02070	5D	W78-02149	5D		
W78-02071	5D	W78-02150	5G		
W78-02072	5E	W78-02151	5B		
W78-02073	5D	W78-02152	2J		
W78-02074	5D	W78-02153	5G		
W78-02075	5D	W78-02154	5F		
W78-02076	5D	W78-02155	5A		
W78-02077	5D	W78-02156	8C		
W78-02078	5D	W78-02157	3F		
W78-02079	5D	W78-02158	2I		
W78-02080	5D	W78-02159	5F		
W78-02081	5C	W78-02160	5F		
W78-02082	5D	W78-02161	5D		
W78-02083	5D	W78-02162	5D		
W78-02084	5D	W78-02163	4B		
W78-02085	5D	W78-02164	5D		
W78-02086	5D	W78-02165	5D		
W78-02087	5D	W78-02166	5G		
W78-02088	5D	W78-02167	5A		
W78-02089	5D	W78-02168	5A		
W78-02090	5D	W78-02169	5A		
W78-02091	5D	W78-02170	5A		

SOURCE

A. C

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B.

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W78-02020--02044 02046--02094	74
Illinois State Water Survey, Hydrology	W78-01972--02000	29
University of Florida, Eastern U. S. Water Law	W78-01716--01722 01724--01733 01736--01763 02095--02102 02104--02120	70
University of Wisconsin, Eutrophication	W78-01889--01890 01892--01913 01915--01916 01919--01935 01937--01939 01941--01942 01946--01949 01951--01952 01954--01956 01958--01967 01969--01970 02019 02121--02123 02167--02184 02186 02188--02193 02195--02200	104
University of Wisconsin, Water Resources Economics	W78-02008 02010--02012 02016--02017	6
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W78-01822--01823	2

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service	W78-01703 01705--01706 01708--01713 01715, 01723 01734--01735 01777, 01891 01914 01917--01918 01936, 01940 01943--01945 01950, 01953 01957, 01968 01971, 02004 02006, 02009 02013--02015 02045, 02103 02151--02152 02158, 02163 02185, 02187 02194	43
Department of Water Affairs	W78-01824--01847	24
Information Planning Associates, Inc.	W78-01848--01857 01883--01888	16
Ocean Engineering Info. Service (Patents)	W78-01701--01702 02124--02150 02153--02157 02159--02162 02164--02166	41
Ocean Engineering Info. Service (Outer Continental Shelf)	W78-01704, 01707 01714 01764--01776 01778--01820	59
Office of Water Research and Technology	W78-01821, 02018	2
U. S. Geological Survey	W78-01858--01882	25

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